No. 47

August 31, 1955

ATOLL RESEARCH BULLETIN

47. *Fishes of the Gilbert Islands*

by John E. Randall

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THE PACIFIC SCIENCE BOARD

National Academy of Sciences—National Research Council

Washington, D. C., U.S.A.

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ACKNOWLEDGMENT

It is a pleasure to commend the far-sighted policy of the Office of Naval Research, with its emphasis on basic research, as a result of which a grant has made possible the continuation of the Coral Atoll Program of the Pacific Science Board.

It is of interest to note, historically, that much of the fundamental information on atolls of the Pacific was gathered by the U. S. Navy's South Pacific Exploring Expedition, over one hundred years ago, under the command of Captain Charles Wilkes. The continuing nature of such scientific interest by the Navy is shown by the support for the Pacific Science Board's research programs, CIMA, SIM, and ICCP, during the past seven years. The Coral Atoll Program is a part of SIM.

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FISHES OF THE GILBERT ISLANDS

by John E. Randall

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Submitted as a report for the Office of Naval Research
Contract No. 695(00)

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ACKNOWLEDGMENTS

The present systematic work constitutes the final report for a part of the research conducted under Contract 695(00) between the Office of Naval Research of the Navy Department and the University of Hawaii. It is based largely on a collection of fishes made by the author while a member of an expedition to the Gilbert Islands in 1951, the second in a series of five in connection with the Coral Atoll Research Project of the Pacific Science Board of the National Research Council. The field work in the Gilberts was supported by Contract N7onr-29104 (NR 089 001) between the Office of Naval Research of the Navy Department and the National Academy of Sciences.

The study of the fishes has been undertaken at both the University of Hawaii and the United States National Museum. I am very grateful for the guidance of Dr. William A. Gosline of the University of Hawaii who has supervised much of this work. Dr. Leonard P. Schultz, the Curator of Fishes of the United States National Museum, Dr. Ernest A. Lachner and others of the National Museum have been most cooperative. Dr. Schultz has made the extensive collections of fishes of the northern Marshall Islands and the manuscripts of his work and that of his collaborators on these fishes freely available to me. The identifications of Gilbert Islands parrot fishes (Scaridae) and frog fishes (Antennariidae), difficult taxonomic groups, were made by Dr. Schultz who is monographing these families. The gobies and eleotrids from the Gilberts will be worked up by Dr. Lachner and the results incorporated with Bikini material for volume 2 of *Fishes of the Marshall and Marianas Islands*. Dr. Lachner kindly confirmed my identifications of the goatfishes (family Mullidae) for this report. Dr. Earl S. Herald identified the seven specimens of pipefishes from Onotoa. The identifications and meristic data of the blennioid fishes (families Blenniidae and Tripterygiidae) were made by Dr. D. W. Strasburg.

I wish to express thanks to the former director, A. B. Walkom and the ichthyologist, Gilbert P. Whitley of the Australian Museum for the loan of a collection of fishes made in the Gilbert Islands by Dr. R. Catala.

My associates in the field, Dr. Preston E. Cloud Jr., the leader of the expedition, Dr. Albert H. Banner, the senior marine zoologist, Dr. D. W. Strasburg, Dr. W. H. Goodenough, and Dr. E. T. Moul were most helpful in innumerable ways.

Special thanks are due Mr. Harold Coolidge, Miss Ernestine Akers, and Mrs. Lenore Smith of the Pacific Science Board who worked tirelessly organizing and equipping the expedition. Assistance was also provided by personnel of the Armed Forces. In the Gilbert Islands the Colony Lands Commissioner Mr. Richard Turpin and his wife at Onotoa and the British officials at Tarawa were exceedingly cooperative.

INTRODUCTION

The Gilbert Islands are a part of the Gilbert and Ellice Islands Crown Colony of Great Britain. They lie in the Pacific Ocean directly southeast of the Marshall Islands and straddle the equator from 3 degrees North Latitude to 3 degrees South Latitude. All are low islands and most are atolls. They are densely inhabited by Micronesian people who are greatly dependent on the sea for food.

In 1951 a research team of six men was sent by the Pacific Science Board of the National Research Council to the Gilbert Islands, specifically Onotoa (1° 47'S., 175° 32' E.), where from June 24 to August 30 a general study of the geology, biology, and anthropology of the atoll was made. The author was given the task of studying the fishes and native fishing methods. In view of the paucity of records of fishes from the Gilbert Islands, the necessary first step was the collection and identification of the fishes of the area. The limited time in the field did not permit much investigation beyond this approach; therefore the present report is largely systematic. A preliminary report on the marine biology of Onotoa has been published (Banner and Randall, 1952). The section of fishes was devoted mainly to fishing methods of the Gilbertese.* An approximate breakdown of the number of species of fishes taken in each family was given, and the methods of collecting fishes were described.

This constitutes the final report on the ichthyofauna of the Gilbert Islands. The majority of the specimens reported on are from Onotoa. A few were taken at Tarawa and Butaritari (Makin). Specimens of 98 species of fishes (excluding gobies and eleotrids) were collected in 1951 by R. Catala at Tarawa, Abemama (Hydrographic Office chart spelling, Apamama), Nukunau, and Marakei (see Figure 1). The Catala collection was loaned by G. P. Whitley of the Australian Museum in order that it might be combined with the collections made by the author.

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*I wish to report an error which appeared on page 43. The Resident Commissioner of the Gilbert and Ellice Islands Colony, through Mr. R. Davies, informed me that the outrigger canoes on Onotoa are not built of Australian plank lumber but Canadian red wood which is imported both by way of Ocean Island and Tarawa. Also it was felt that my statement on page 57 concerning the short time required by the Onotoan fisherman for his daily catch of fish should be qualified by adding "when tides, weather, etc. are suitable". I concur in this.

Also included are all records of Gilbert Islands fishes from the literature which appear to be valid. Those with insufficient descriptive information which could be confused with closely related forms are excluded. In spite of my caution, some misidentifications probably occur among the literature records I have chosen to incorporate.

A list of works in which Gilbert Islands fishes are cited is given at the end of this report. Only three of these contain more than a few records of fishes from the Gilberts: Günther's Andrew Garrett's Fische der Südsee (1873-1910), Fowler's Fishes of Oceania (1928) and Whitley and Colefax' Fishes from Nauru, Gilbert Islands, Oceania (1938). Like Günther, Fowler based his Gilbert Islands fish records on the specimens collected by Garrett. He examined many of these at the Museum of Comparative Zoology, Harvard College. Although he duplicated many of Günther's references to fishes from the Gilberts, some original records are to be credited to him. Günther often generalized on the range of widely distributed species whereas Fowler listed most of the localities by island groups. Both Günther and Fowler often employed the locality name Kingsmill Islands. This is probably equivalent to the Gilbert Islands as a whole; however the name Kingsmills has also been applied to Tabiteuea and subordinate islands within the Gilberts. Therefore all locality records of Kingsmill Islands are cited as such. Whitley and Colefax added new records to those already known for Nauru and reviewed the literature for reports of collections of fishes from this island and Ocean Island. The most important prior work was that of Waite (1903). Although Nauru and Ocean lie about 370 and 220 miles, respectively, from the nearest of the Gilbert Islands proper, they are often treated as part of the Gilbert Islands. Therefore I am including herein the seemingly authentic records from Whitley and Colefax. These should be regarded with even more suspicion than records from Fowler, however, for most are mere listings of the scientific names of fishes without any descriptive data. Mr. Whitley has informed me by letter that the majority of the specimens of the Australian Museum upon which the Nauru-Ocean study was based are no longer in existence.

When specimens of a species reported in the literature were available to me, the previous records are not included, generally, unless there is a disparity in nomenclature to which I wish to call attention.

No new species are described in this report.

A total of 396 species of inshore marine and pelagic fishes are here recorded from the Gilbert Islands. An estimated 16 more in the families, Gobiidae and Eleotridae will be reported on by E. A. Lachner in volume 2 of Fishes of the Marshall *and Marianas Islands*. It should be emphasized that this is not even a near-definitive list of all the species which occur in the Gilberts, a fact which is readily apparent when the number of species in almost any family of fishes from the northern Marshall Islands treated by Schultz and collaborators (1953) is compared with the same family in this report.

The fish fauna of the oceanic islands of the tropical Pacific is particularly uniform (the Hawaiian Islands excepted) for so vast an area. It is therefore not surprising that the fishes of the Gilbert Islands are very similar to those of the Marshall Islands, especially since only about 170 miles separate the northern Gilberts from the southern Marshalls. The similarity was evident from underwater observation by the writer in the southern Marshalls prior to and following the expedition to Onotoa. Subsequent study of the Gilberts collections and comparison with Marshall Islands material clearly demonstrated the high percentage of species of fishes common to both island groups. Disparity in the recorded faunas, such as the greater number of species known from the Marshalls, is undoubtedly a result of differences in the intensity of collecting. Of the species from the Gilberts of which I have seen specimens, only 31 in the families treated by Schultz *et al* in volume 1 of *Fishes of the Marshall and Marianas Islands* are here listed from the Gilbert Islands and are unrecorded from the northern Marshalls. These are as follows:

Harengula kunzei
Chanos chanos
Murenophis pardalis
Uropterygius micropterus
Uropterygius macrocephalus
Hemiramphus marginatus
Cypselurus suttoni
Prognichthys albimaculatus
Myripristis adustus
Mugil seheli
Epinephelus horridus
Epinephelus coeruleopunctatus
Epinephelus flavocoeruleus
Cephalopholis hemistiktos
Cephalopholis sonnerati
Anthias squamipinnis
Mirolabrichthys tuka
Apogon auritus
Apogon doryssa
Pseudamia polystigma
Gymnapogon philippinus
Lutjanus vaigiensis
Caesio caerulaureus
Gerres oblongus
Chaetodon bennetti
Chaetodon vagabundus
Chaetodon meyeri
Heniochus acuminatus
Heniochus varius
Acanthurus maculiceps
Paracanthurus hepatus

Nine of the above, *H. kunzei*, *C. chanos*, *U. micropterus*, *M. adustus*, *M. tuka*, *G. philippinus*, *L. vaigiensis*, *C. vagabundus*, and *C. meyeri* have been recorded by D. W. Strasburg from the southern Marshall Islands in a mimeographed report for the Office of Naval Research. Most of the rest will probably ultimately be taken from the Marshalls for they are known from other island groups in Oceania. Only *Cephalopholis hemistiktos*, *Anthias squamipinnis*, *Pseudamia polystigma*, *Acanthurus maculiceps*, and *Paracanthurus hepatus* are here recorded from the Gilbert Islands and not elsewhere from oceanic islands of the Pacific.

Nearly all of the Gilbert Islands fishes listed in the present report are also found in the Indo-Malayan region. This is contrary to Ekman (*Zoogeography of the Sea*, 1953: 19) who states, "In 1905 Jordan & Seale listed 475 species of fish from Samoa of which 92 (or 19%) were new to science, although they belonged to Indo-Australian genera." "The great number of endemic species among the Samoan fish fauna which we have just mentioned suggests that the present faunistic connections between Polynesia-Micronesia and the Indo-Australian centre of distribution are rather weak." It is unfortunate that Ekman chose the work of Jordan and Seale upon which to draw conclusions concerning the zoogeography of marine fishes in the tropical Pacific, for many of the species described as new by these authors are no longer valid (or are valid but have turned up in the Indo-Malayan region). 65 of their new species are listed as synonyms by the authors of *The Fishes of the Indo-Australian Archipelago* (Weber, de Beaufort, Chapman, and Koumans) (1911-1953), and by Schultz and collaborators (1953) and by Fowler (1928). Species placed in synonymy by one of these authors (except Fowler) but recognized as good species by others are not included among the 65. Although some of these 65 synonyms may ultimately prove to be valid species, still others not yet in synonymy will probably become synonyms.

Although there is no large number of species apparently endemic to Oceania in general, a sufficient number exists to indicate that some are truly confined to the oceanic islands of the tropical Pacific. A few of these, apparent examples being *Acanthurus achilles*, *Pomacentrus vaiuli*, and *Apogon snyderi*, are abundant in the Pacific. All such species need not be regarded as truly endemic in the sense that they arose in Oceania. It is possible that some of them were once present in the Indo-Malayan region but are surviving only in the Pacific.

Endemic species of fishes with pelagic larvae would not be expected, *a priori*, to arise in the waters of the islands of most of Oceania because of insufficient isolation. Of the major island groups in Oceania, only the Hawaiian Islands are well isolated, and the high percentage of endemism in Hawaiian fishes attests to the efficacy of such isolation.

One possible means of increasing the number of species of fishes peculiar to broad areas of Oceania makes use of Hawaiian endemism. If a species of fish of the western Pacific reached the Hawaiian Archipelago at such infrequent intervals that it was effectively isolated in Hawaii and evolved to a degree that it was no longer capable of interbreeding with the progenitor stock, it might invade more southern and western areas from Hawaii if a niche were available. *Apogon snyderi* and *Apogon menesemus* represent possible examples of this mode of evolution and distribution (see discussion under *A. snyderi*).

The enormous number of species of marine organisms of the Indo-Malayan region, along with a large number peculiar to this area, has led to its designation as the center of distribution of the Indo-Pacific fauna. It is generally accepted that most of the fishes of Oceania have been distributed out into the Pacific from the East Indies and Philippines. Since these islands are not isolated from other islands or continents, the explanation of the evolution which has occurred in these waters would seem to demand some effective means of isolation within the area. The islands are numerous, volcanic, and many are large. It is known that they have been variously connected in the past. It is not difficult to suppose that good-sized arms of the sea might have been isolated for long periods of time. Perhaps even the tropical Indian and Pacific Oceans were separated by land, resulting in a situation comparable to that at the isthmus of Panama (witness the geminate species of Jordan).

The identifications of the fishes in this report and the original citations of the genera and species are based largely on volume 1 of _Fishes of the Marshall and Marianas Islands_ (1953) by Schultz _et al_ and the manuscripts to volume 2. This work supercedes Schultz' _Fishes of the Phoenix and Samoan_ Islands (1943) as the most important and useful taxonomic treatise of the fishes of the oceanic islands of the tropical Pacific (except Hawaii). As pointed out by Schultz (1953: xix) the vast Indo-Pacific fauna cannot be interpreted on a local basis. More than most authors of faunal studies, Schultz _et al_ have not restricted themselves to the mere tagging of species with the most convenient names at hand but have attempted tentative revisions of many of the genera. Complete revisions are, of course, beyond the scope of their study. In spite of the great improvement they have brought to the systematics of fishes in Oceania, many of the groups treated are in need of further revision, not from the faunal approach, however, but on a world-wide basis. Therefore some of the names in _Fishes of the Marshall and Marianas Islands_ and hence of this report will eventually be changed.

In my write-up, I have sought to provide sufficient diagnostic information for each species to enable subsequent workers to resolve their identity with assurance, name changes notwithstanding. The importance of coloration as a factor in the recognition of fishes has been stressed by Schultz (_op. cit_: xix). A detailed color description alone will serve to distinguish the majority of the species herein, even from closely related forms. I have therefore placed considerable emphasis on color. The life colors of many of the species are given from notes made when they were collected. The colors of still more are described from 35 mm Kodachrome transparencies taken by me in the Gilberts. Some of these descriptions represent the first records of the color in life of the species. Meristic data are tabulated for the following families: Exocoetidae, Cirrhitidae, Pomacentridae, Acanthuridae, Balistidae, Monacanthidae, and Tetraodontidae. These tables appear at the end of the respective family sections. The counts made for other families are given for the individual species in abbreviated style after the listing of the number of specimens examined and the island where collected. The number of specimens on which counts were made is indicated in parenthesis following the counts. Too few species have been collected in the Gilbert Islands from most of the families to warrant the preparation of keys. Keys are given only for the Apogonidae, Cirrhitidae, Pomacentridae, Acanthuridae, Balistidae, and Monacanthidae. Generally, the keys presented by Schultz *et al* work very well for the identification of Gilbert Islands fishes.

All lengths of specimens are standard length. Gill raker counts include all rudiments. When a single number is given, it represents the total count on the first gill arch. Counts of pectoral fin rays include all elements.

In addition to descriptive data, there are often remarks on the relative abundance of the species, and the areas within the atolls where they were collected and/or observed are usually given. No field data of any sort were available with the fishes collected by Catala, however. It should be noted that the relative abundance of many of the species varied markedly from atoll to atoll and even at what seemed to be equivalent localities within the same atoll. Also the listing of the area where a particular species was collected or observed does not imply that this area represents the physical habitat of the species, although such is probably often the case.

The areas from which species of fishes were taken were usually designated by the following: lagoon (with qualifications), channel, outer reef flat, surge channel, coralliferous terrace (outer reef bench), or pelagic (open sea). Figure 2 may assist the reader in visualizing these localities. The lagoon is the body of water enclosed by the ring of coral reef and islands that comprise the atoll. Onotoa is lacking land area on the lee or southwest side of the atoll; nevertheless the customary reef occurs here to more or less complete the ring. The lagoon side of this reef is designated lagoon or west reef (no collections were made from the ocean or western side of this reef). Much of the Onotoa lagoon is shallow and sandy with only occasional isolated coral heads reaching near the surface. The greatest depth is 8 fathoms. Channels connecting the lagoon and the open sea are very shallow on the weather or northeast side of the atoll; they are usually exposed or nearly exposed at low tide. Breaks or passes through the reef on the lee side are of greater depth, up to 2 fathoms or more. The term outer reef is applied to reef areas outside of the lagoon. Extending out from shore on the weather side of the atoll there is a reef flat which varies from about 600 to 2000 feet in width. It is entirely covered at high tide and exposed with numerous shallow tide pools at low tide. The outer edge of this reef is dissected with highly tortuous surge channels of about 40 to 80 feet in length and sloping from about 4 feet in depth down to 8 or 10 feet at the reef front. Surf breaks heavily against the reef front and sweeps into the surge channels. The reef area between the surge channels is somewhat elevated and pink in color due to the encrusting growth of coralline red algae, largely *Porolithon*. Behind the surge channel area there is a distinct shallow depression in the reef flat, the so-called back ridge trough. Beyond the surge channel zone is the coralliferous terrace sloping from 8 or 10 feet down to about 50 feet in depth over a distance of about 200 feet or more. This bench ends suddenly with a cliff-like drop into deep water. The coralliferous terrace is very rich in coral growth, being dominated by low flattened stands of *Acropora*. It possesses an abundant and highly varied fish fauna. Unfortunately it was not adequately sampled. For a more detailed account of the geology and marine environments of Onotoa, see Cloud (1952).

An analysis of the stomach contents of some of the fishes was made, especially when a surplus of specimens was available.

The local Gilbertese names for fishes are recorded on pages 238 to 240. These were obtained by interviews with natives on Onotoa. It was found that many of the smaller species had no names. Collecting with rotenone resulted in the taking of many fishes which the natives had never seen and for which they obviously had no names. There was not always complete agreement among the Gilbertese on Onotoa for their names of fishes. Also it is expected that considerable variation of local names will be found from atoll to atoll.

The first series of specimens from the Onotoa fish collection is deposited in the United States National Museum in Washington, D. C. The bulk of this series is cataloged under U.S.N.M. numbers 167177 to 167553. A second series is located at the University of Hawaii, Honolulu. The Catala collection was returned to the Australian Museum at Sydney.

The typewritten field notes are on file at the Division of Fishes, United States National Museum.

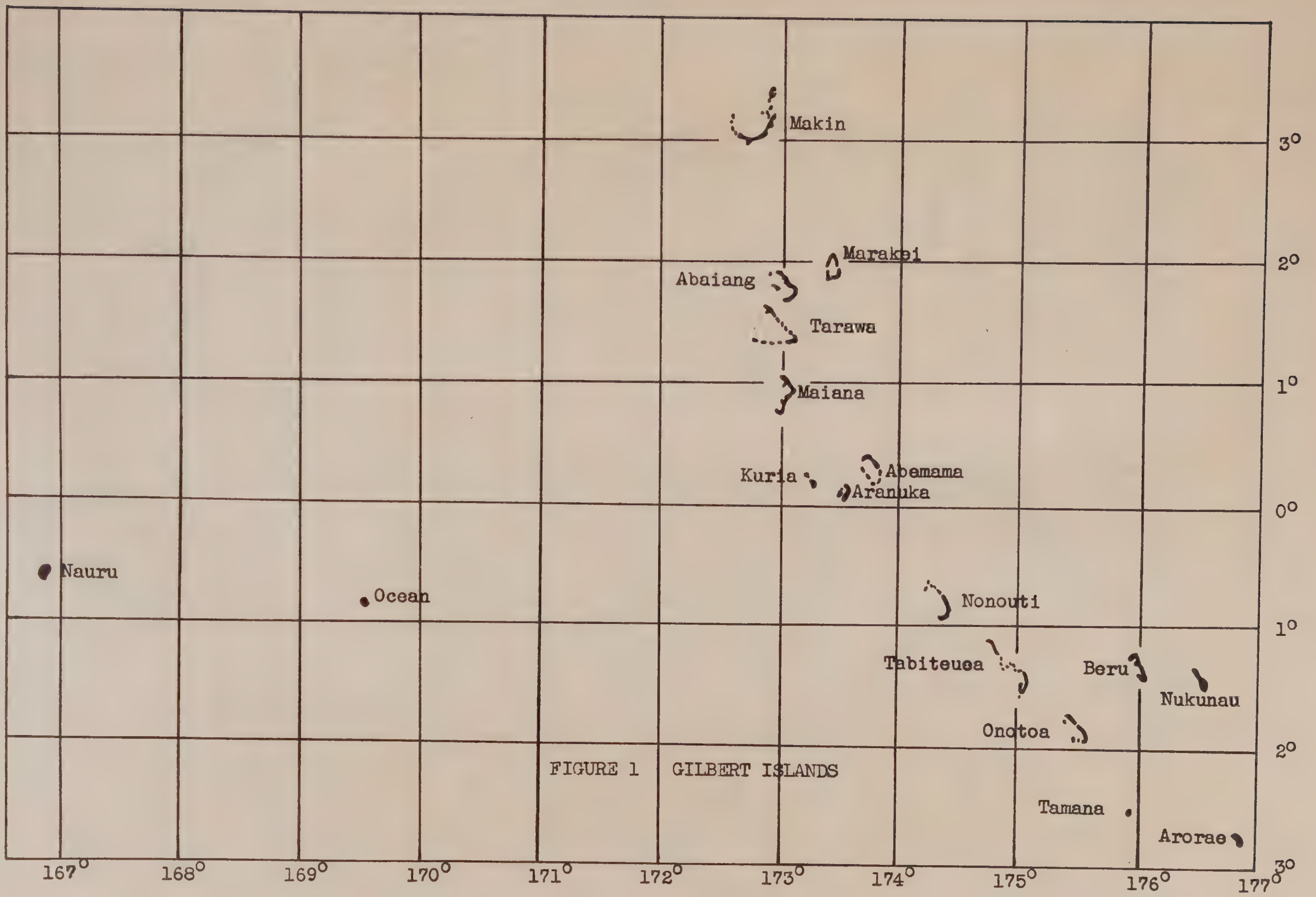
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FIGURE 1 GILBERT ISLANDS

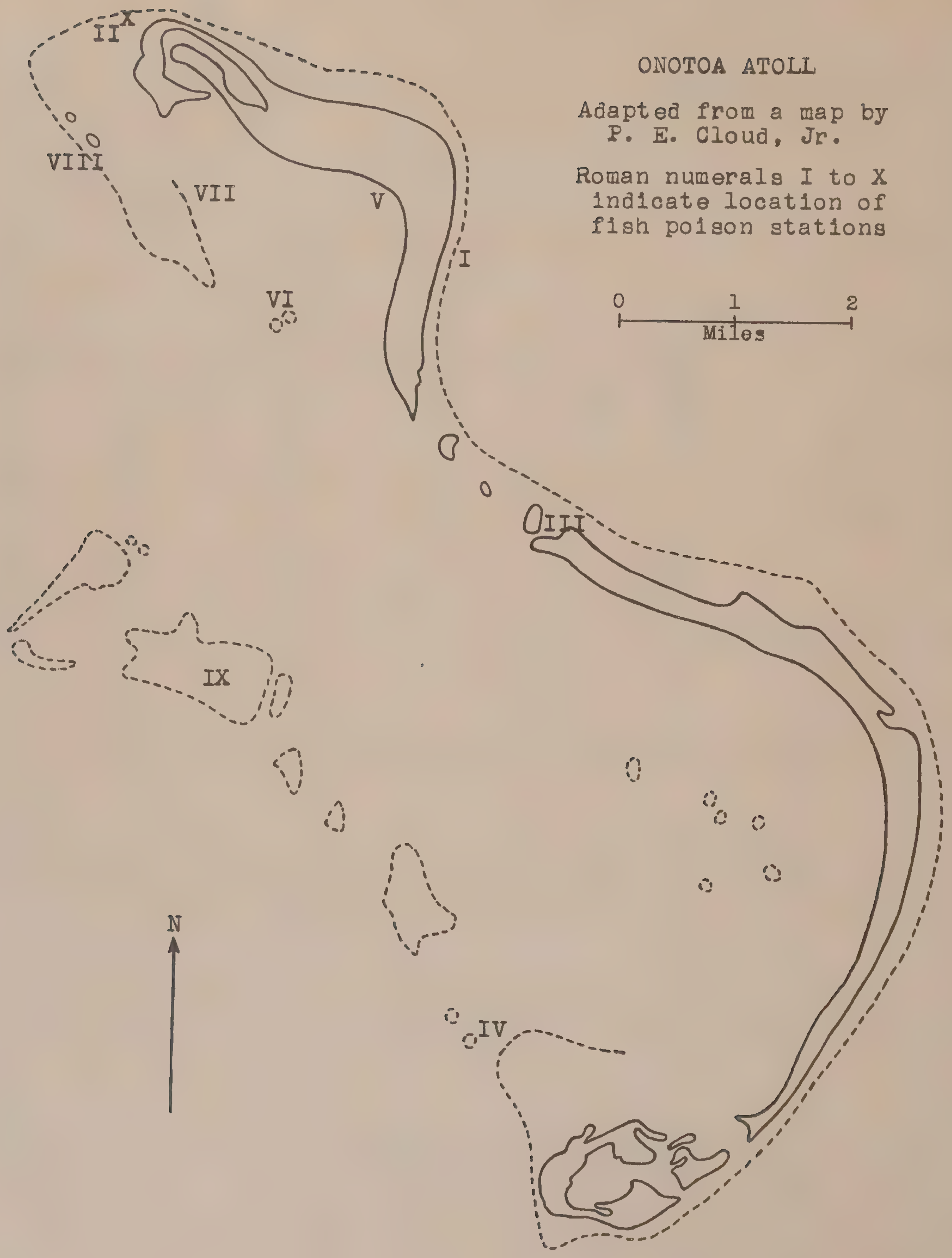
ONOTOA ATOLL
Adapted from a map by P. E. Cloud, Jr.
Roman numerals I to X indicate location of fish poison stations
0
1
2
Miles
N
X
II
VIII
VII
V
I
VI
III
IX
IV

Figure 2

Family ORECTOLOBIDAE

Genus GINGLYMOSTOMA

Ginglymostoma Müller and Henle 1837. Sitz-Ber. Ada. Wiss. Berlin, p. 113. (Type species Squalus cirratus Bonnaterre).

Ginglymostoma ferrugineum

Scyllium ferrugineum Lesson 1830. Voyage autour du monde... "Coquille", Zool., vol. 2, pt. 1, p. 95. (Type locality, Port Praslin, New Ireland and Offack Bay, Waigiu).

1 specimen. 877 mm (total length). Onotoa.

Snout blunt, the distance from tip to mouth aperture 26 mm; interorbital space 90 mm; eye small, its greatest diameter 9 mm; spiracle 13 mm behind eye and slightly ventral to eye, its diameter about 2 mm; third gill opening just above origin of pectoral fin; fourth and fifth gill openings close together; length of first gill opening 21 mm, of last 22 mm; horizontal distance from snout to first gill opening 122 mm; nasal opening with an elongate papilla, 15 mm in length; all fins pointed, posterior margins slightly concave; origin of first dorsal fin slightly in advance of origin of pelvic fins; origin of second dorsal fin about 15 to 20 mm in advance of origin of anal fin; length of caudal fin from origin of lower lobe to outer tip of upper lobe 275 mm; tip of caudal fin bilobed ventrally, the outer lobe about 8 mm wide, the inner about 17 mm; teeth small (one upper tooth measured 1.5 mm in height and 2.5 mm in width), the margin rounded, with 14 denticulations; centermost denticulation about twice as broad as adjacent denticulations and projecting slightly more than others.

Color yellowish brown, shading to tan ventrally.

The specimen was captured by a Gilbertese native who grabbed it by the tail when he observed the shark with its head in a hole in the coral, apparently trying to feed on fish poisoned by rotenone. The poison station was run on the lagoon side of the west reef in about 5 feet of water. The shark seemed quite unaffected by the rotenone.

This specimen compares closely with the description given by Schultz (1953: 4) for an 885 mm specimen of the species. The most notable difference is in the teeth. Schultz states that the teeth of his specimen had a central pointed cusp, notably projecting. In my specimen there is a broad central denticulation, but it projects only slightly more than the others. I was unable to locate the head of the 2260 mm specimen from Bikini in the U. S. National Museum for direct comparison. The 885 mm Bikini specimen is at the University of Washington and was not seen by me.

Family TRIAKIDAE

Genus TRIAENODON

Triaenodon Müller and Henle 1837. Sitz.-Ber. Akad. Wiss. Berlin, p. 117. (Type species, Carcharias obesus Rüppell).

Triaenodon obesus

Carcharias obesus Rüppell 1835. Neue Wirbelth, Fische. p. 64, pl. 18, fig. 2. (Type locality, Red Sea).

No specimens of this blunt-nosed species were secured; however, it was often seen in both the outer reef areas and the lagoon. The tips of the dorsal fins and both lobes of the caudal fin were white and in sharp contrast to the dark gray color of the rest of the shark.

Family CARCHARHINIDAE

Genus CARCHARHINUS

Carcharhinus Blainville 1816. Bull. Soc. Philom., p. 121. (Type species, Squalus commersonii Blainville).

Carcharhinus menisorrah

Carcharias (Priodon) menisorrah Müller and Henle 1841. Syst. Beschreibung Plagiostomen, p. 46, pl. 17. (Type locality, Java, Australia, and Red Sea).

1 specimen (dorsal fin, caudal fin, and part of upper jaw only). estimated length 6 feet. Onotoa.

The specimen was seen only after it was cut into pieces by Gilbertese fishermen. It was dark gray in color. The largest upper teeth measure 9 mm at the base and 6.5 mm in vertical height from the gums; edge of these teeth serrated, the serrations becoming very small at the tip; largest denticulations on basal third of anterior margin (this margin showing a slight angular indentation at this point); posterior margin of teeth indented about 2 mm at half-way mark, the two edges of this indentation being nearly straight; length of upper lobe of caudal fin 450 mm; end of upper lobe of caudal fin with 2 small ventrally-directed lobes, the outer one pointed and measuring 11 mm at its base, the more anterior one 64 mm at the base, with outer margin concave; dorsal fin (probably the second dorsal) measures 144 mm at the base and 145 mm in height; it has a long (about 70 mm) pointed postero-basal projecting portion; 23 round radial elements of the fin have been cut in cross-section.

Carcharhinus melanopterus

Carcharias melanopterus Quoy and Gaimard 1824. Voyage autour du monde..."Uranie", Zool., p. 194, pl. 43, figs. 1, 2. (Type locality, Waigiou Island).

1 specimen. 415 mm (total length). Onotoa.

1 specimen (fins only). Tarawa.

Color in alcohol: upper two-thirds of body grayish brown, lower third light tan; a light tan band in lower part of gray-brown region from above pectoral fin to above origin of anal fin (this band only faintly visible); tips of all fins and margins of lobes of caudal fin jet black.)

This was the most common reef shark at Onotoa. It was rarely troublesome.

Genus NEGAPRION

Negaprion Whitley 1940. Fish. Aust., vol. 1, p. 111. (Type species, Aprionodon acutidens queenslandicus Whitley).

Negaprion acutidens

Carcharias acutidens Rüppell 1835. Neue Wirbelth., Fisch., p. 65, pl. 18, fig. 3. (Type locality, Red Sea).

Aprionodon acutidens Garman 1913. Mem. Mus. Comp. Zool., vol. 36, p. 118. (Abaiang, Gilbert Islands).

Bigelow and Schroeder (Fishes of the Western North Atlantic, pt. 1, 1948: 304) referred Carcharias acutidens Rüppell to the genus Negaprion.

Family MYLIOBATIDAE

Genus AETOBATUS

Aetobatus Blainville 1816. Bull. Soc. Philom. Paris, vol. 8, p. 127. (Type species, Raia narinari Euphrasen).

Aetobatus sp.

A white spotted eagle ray was observed to leap free of the water in the Onotoa lagoon. It may have been A. narinari. Shallow, roughly circular excavations were found in channel areas separating islets at Onotoa. The presence of pelecypod shell fragments suggested that these excavations were dug by rays. A. narinari is well known for such a mode of feeding; however, many other rays also feed in this manner.

Genus PTEROMYLAEUS

Pteromylaeus Garman 1913. Mem. Mus. Comp. Zool., vol. 36, p. 437. (Type species, Myliobatis asperrimus Jordan and Evermann).

Pteromylaeus punctatus

Myliobates punctatus Maclay and Macleay 1886. Proc. Linn. Soc. N. S. Wales, vol. 10, p. 675, pl. 46, figs. 1-6. (Type locality, Admiralty and Lub or Hermit Islands) (Reference copied from Fowler, 1928; Herre, 1942, gives the authors as Mikluho-Maklai and Macleay).

Pteromylaeus punctatus Herre 1942. Copeia, no. 3, p. 194. (Nauru).

Family MOBULIDAE

Genus MANTA

Manta Bancroft 1828-29. Zool. Jour., vol. 4, p. 144. (Type species, Cephalopterus manta Bancroft).

Manta sp.

A large manta ray, at least ten feet in total width was observed swimming slowly near the surface at the outer edge of the coralliferous terrace at Onotoa. It appeared to be entirely black on the dorsal surface; however, it was viewed from the side and distinctive markings could have been missed.

Family CLUPEIDAE

Genus CLUPEA

Clupea Linnaeus 1758. Syst. nat., ed. 10, p. 522. (Type species, Clupea harengus Linnaeus).

Clupea sirm

Clupea sirm Forskål 1775. Descr. animalium, p. 17. (Type locality, Red Sea).

Clupea sirm Günther 1910. Jour. Mus. Godeffroy, vol. 16, pt. 8, p. 383. (Kingsmill Islands).

Both Jordan and Seale (1906) and Fowler (1928) placed this species in genus Sardinella Cuvier and Valenciennes).

Genus HARENGULA

Harengula Cuvier and Valenciennes 1847. Hist. nat. poiss., vol. 20, p. 277. (Type species, Harengula latulus Cuvier Valenciennes = Clupea macrophthalma Ranzani).

Harengula kunzei

Harengula kunzei Bleeker 1856. Nat. Tijdschr. Ned.-Ind., vol. 12, p. 209. (Type locality, Ternate).

6 specimens. 81 - 94 mm. Tarawa.

D II,16 or 17; A I,16 or 17; P 15 or 16; V 8; transverse scale rows from gill opening to base of caudal fin 42 or 43; scutes in midventral line posterior to origin of ventral fins 13. (2 specimens).

Color in alcohol silvery, brown on back; tips of jaws blackish; a short black line mid-dorsally on snout.

Depth of body 3.8 in standard length; head 3.5 in standard length; eye 3.2 in head; adipose eyelid covering iris anteriorly and posteriorly.

A school of this species was observed at the surface next to a dock in the lagoon at Tarawa. Large carnivorous fishes (probably barracuda or carangids) were preying upon it from below.

Family DUSSUMIERIDAE

Genus SPRATELLOIDES

Spratelloides Bleeker 1851. Nat. Tijdschr. Ned.-Ind., vol. 2, p. 214. (Type species, Clupea argyrotaenia Bleeker).

Spratelloides delicatulus

Clupea delicatula Bennett 1831. Proc. Zool. Soc. London, pt. 1, p. 168. (Type locality, Mauritius).

97 specimens. 7 - 24 mm. Abemama.

11 specimens. 35 - 45 mm. Marakei.

D 12; A 10; P 11 to 13; V 8. (4 specimens).

The specimens are in very poor condition. No scale counts could be made.

Family CHANIDAE

Genus CHANOS

Chanos Lacépède 1803. Hist. nat. poiss. vol. 5, pp. xxix, 395. (Type species, *Chanos arabicus* Lacépède).

Chanos chanos

Mugil chanos Forskål 1775. Descr. animalium, pp. xiv, 74. (Type locality, Djedda, Red Sea).

3 specimens. 117 - 400 mm. Onotoa.

D 15; A 10; V 10; P 18; lateral line scales 83. (2 specimens).

Color in life silvery.

This species is well known to the Gilbertese who used to capture the young and place them in brackish ponds, ultimately to harvest them as adults. Such a practice has only recently been discontinued.

Family SYNODONTIDAE

Genus SYNODUS

Synodus Scopoli 1777. Introductio ad histor. natur...p. 449. (Type species, *Esox synodus* Linnaeus).

Synodus variegatus

Salmo variegatus Lacépède 1803. Hist. nat. poiss., vol. 5, p. 157, pl. 3, fig. 3. (Type locality, Mauritius).

3 specimens. 90 - 148 mm. Onotoa lagoon.

D 11; A 9; P 12; V 8; lateral line scales 61; scales from lateral line to origin of dorsal fin 5½. (2 specimens).

Color in alcohol tan with about 9 vertical dark brown bars dorsally on body, the lower part of each being spot-like and centered on lateral line; all fins pale; 3 pairs of small black dots on upper surface of snout; a black dot at anterior base of anterior nostril.

Palatine teeth in a single band. Teeth nearly completely covered by lips.

Genus SAURIDA

Saurida Cuvier and Valenciennes 1849. Hist. nat. poiss., vol. 22, p. 499. (Type species, Salmo tumbil Bloch).

Saurida gracilis

Saurus gracilis Quoy and Gaimard 1824. Voyage autour du monde..."Uranie", Zool., p. 224. (Type locality, Hawaiian Islands and Mauritius).

9 specimens. 108 - 150 mm. Onotoa.

D 11; A 10; P 13; lateral line scales 52; scales from lateral line to origin of dorsal fin 3½. (3 specimens).

Color from 35 mm Kodachrome transparency white, densely mottled with blackish brown, the most conspicuous markings being a series of nine blotches along the side of the body, each of which extends slightly above lateral line; a pair of smaller blackish blotches, one above the other, (or a single small blotch) in the pale area between each of the larger blotches; caudal fin and posterior half of dorsal fin with irreguler vertical blackish markings; paired fins with dusky spots; anal fin pale; adipose fin with a single blackish spot; dusky spots on chin; pupil of eye green.

Teeth on palatine in two rows, the inner row much shorter than the outer; teeth in jaws extend laterally and are exposed when mouth is closed.

All of the specimens but one were taken from sandy areas of the lagoon.

Family MURAENIDAE

The moray eels were abundant at Onotoa, and a good representation of all of the genera except Anarchias were taken. Apart from one instance of biting a fish impaled on a spear, no morays exhibited any overt viciousness such as is often attributed to them. The Gilbertese valued eels as food and captured them with traps, by spearing, and with hook and line. An old method, not much used today, involves a noose which can be tightened on the end of a stick. This is placed over an eel's hole and drawn tightly around his body after he is lured out with bait.

Genus ECHIDNA

Echidna Forster 1777. Icones ineditae, p. 181. (Type species, Echidna variegata Forster).

Echidna zebra

Gymnothorax zebra Shaw 1797. Nat. Misc., vol. 9, pl. 322.

2 specimens. 550 and 600 mm. Onotoa.

Color in alcohol dark brown with numerous pale yellowish lines encircling body more-or-less vertically (the 550 mm specimen has 55 such lines and several shorter lines dorsally which do not encircle body); vertical lines about one-third to one-fourth as narrow as intervening dark areas; anterior part of head with short irregular pale yellow lines and spots.

The teeth are molariform, as in other species of Echidna.

The two adult specimens were taken with rotenone from the lagoon side of the west reef.

Echidna polyzona

Muraena polyzona Richardson 1844. Zool. voyage "Sulphur", Ichthyology, p. 112, pl. 55, figs. 11-14.

1 specimen. 160 mm. Onotoa.

Color in alcohol light reddish tan with 30 broad black vertical bars on the body which extend and become narrower on dorsal and anal fins; vertical black bars about 2 to 3 times broader than intervening pale areas; head with a broad vertical band which passes through eye on to chin; tip of snout and lower jaw dusky; nostrils pale.

The specimen was collected from a coral-rich area of the outer reef in about 7 feet of water.

Echidna nebulosa

Muraena nebulosa Ahl 1789. Specimen ichthyologicum de Muraena et Ophichtho (Thunberg), p. 7, pl., right fig.

(Type locality, East India).

1 specimen. 220 mm. Tarawa.

Color in alcohol light brown with 24 round black circles in a row on side of body, each with arboreal-like projections radiating from outer margin; a second row of similar blotches dorsal to the first, each of which is usually in line with a blotch of the row below; blotches of dorsal row extend into dorsal fin; a third row of blotches anterior to anus and ventral to mid-lateral row (these blotches are solid black and less dendritic); between the major black blotches on the body are tiny short irregular lines and spots, many of which are stellate or dendritic.

Echidna leucotaenia

Echidna leucotaenia Schultz 1943. Bull. U. S. Nat. Mus. 180, p. 22, pl. 3. (Type locality, Phoenix and Samoa Islands).

2 specimens. 280 and 420 mm. Onotoa.

Color in alcohol brown; fins dark brown with broad whitish margins (the margins are about twice as broad relative to the rest of the fins in the 280 mm specimen as in the 420 mm specimen); head anterior to a line running from just behind rictus to just behind eye dark brown with whitish blotches surrounding the mucous pores on the sides of the jaws.

The two specimens were taken from the same habitat as the specimen of Echidna polyzona.

Genus ENCHELYNASSA

Enchelynassa Kaup 1855. Arch. Naturg., vol. 21, p. 213. (Type species, Enchelynassa bleekeri Kaup = Muraena canini Quoy and Gaimard).

Enchelynassa canini

Muraena canini Quoy and Gaimard 1824. Voyage autour du monde..."Uranie"...Zool., p. 247. (Type locality, Waigiou and Rawak).

1 specimen. 750 mm. Onotoa.

Color in life dark brown with very narrow irregular vertical blackish lines on body.

The single specimen taken was poisoned with rotenone in a surge channel.

Genus MURENOPHIS

Murenophis Cuvier 1798. Tableau élémentaire de l'histoire naturelle des animaux, p. 329. (Type species, Muraena helena Linnaeus).

Murenophis pardalis

Muraena pardalis Temminck and Schlegel 1846. Fauna Japonica, Pisces, pt. 5, p. 268, pl. 119.

2 specimens. 76 and 180 mm. Onotoa surge channel.

Color from 35 mm Kodachrome transparency orange-brown with prominent white spots and smaller dark brown spots on body and fins; head with alternating vertical white and dark brown, orange-centered bands.

Genus GYMNOTHORAX

Gymnothorax Bloch 1794. Natur. ausländ. Fische, vol. 9, p. 83. (Type species, Gymnothorax reticularis Bloch).

Gymnothorax schismatorhynchus

Muraena schismatorhynchus Bleeker 1853. Nat. Tijdschr. Ned.-Ind., vol.4, p. 301. (Type locality, Sumatra).

6 specimens. 190 - 750 mm. Onotoa.

Color in alcohol grayish brown with a narrow whitish margin on fins.

This species has slender, slightly hooked jaws similar to those of Enchelynassa canini and Murenophis pardalis. The dentition fits the diagram given in Fig. 4 by Schultz (1943).

All of the specimens were taken from two stations of the outer reef in the northern part of the atoll in about 6 to 7 feet of water where coral was abundant.

Gymnothorax monostigma

Muraena monostigma Regan 1910. Ann. Mag. Nat. Hist., ser. 8, vol. 4, p. 438. (Type locality, Tahiti and Raiatea).

12 specimens. 90 - 500 mm. Onotoa.

Color in alcohol orangish brown; fins orangish, especially posteriorly; a large black spot immediately behind eye (this is missing on the 90 mm specimen and just making its appearance in a 130 mm specimen); posterior nostrils white; two mucous pores below eye and 4 or 5 on lower jaw surrounded by white, thus appearing as spots (in the 130 mm specimen the white spots are large and co-joined).

The specimens were taken from four stations, each quite different; surge channel, windward side; surge channel, leeward side; backridge trough; lagoon reef. The specimen from the backridge trough was the 130 mm one mentioned above. It was caught by hand by A. H. Banner from a small head of *Pocillopora meandrina*. In life it had a bright orange border on its fins which was broad caudally, and the eye was bright red.

Gymnothorax picta

Muraena picta Ahl 1789. Specimen ichthyologicum de Muraena et Ophichtho, p. 8. (Type locality, East India).

2 specimens. 340 and 450 mm. 2 specimens. 70 and 85 mm. Onotoa.

2 specimens. 250 and 310 mm. Tarawa.

Color in life white, densely speckled with black except ventrally.

This eel is a common inhabitant of the crevices of the outer reef flat. At low tide it was at times encountered by turning over rocks exposed on the reef. Gilbertese natives were occasionally seen hunting for it in just this manner for use as food.

Gymnothorax petelli

Muraena petelli Bleeker 1856. Nat. Tijdschr. Ned.-Ind., vol. 11, p. 84. (Type locality, Java).

Siderca picta Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 287. (Nauru).

5 specimens. 110 - 300 mm. Onotoa.

Color from 35 mm Kodachrome of 200 mm specimen white with 19 vertical bars on body, about equal or slightly smaller in width than white inter-spaces (posterior 14 dark bars do not extend to extreme margin of dorsal fin); a black band across head slightly behind eye, this band not extending ventral to eye; a blackish area from eye anterior to nostril; a black mark on chin next to mouth. Larger specimens were browner and the black bars did not stand out in such sharp contrast.

Specimens were collected from both lagoon and outer reefs.

Gymnothorax rupelli

Dalophis rupelliae McClelland 1845. Calcutta Jour. Nat. Hist., vol. 5, p. 213. (Type locality, Red Sea?)

Lycodontis ruppeli Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 55. (Abaiang, Kingsmill Islands).

1 specimen. 250 mm. Onotoa.

Color in alcohol light brown with 17 black rings which completely encircle head and body; dorsal half of body between dark bars dusky.

G. rupelli can most readily be distinguished from the similar petelli by the nature of the rings. In the latter those anteriorly on the body and head do not circle the ventral part of the body.

Gymnothorax zonipectis

Gymnothorax zonipectis Seale 1906. Occ. Pap. B. P. Bishop Mus., vol. 4, p. 7, fig. 1. (Type locality, Tahiti).

Gymnothorax zonipectis Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol, 63, p. 285. (Nauru).

Gymnothorax gracilicauda

Gymnothorax gracilicauda Jenkins 1903. Bull. U. S. Fish Comm., vol. 22, p. 426, fig. 6. (Type locality, Honolulu).

4 specimens. 88 - 240 mm. Onotoa.

Color in alcohol light brown with dendritic dark brown blotches in two to three irregular lengthwise series on body; two irregular vertical dark brown bars on head between eye and origin of dorsal fin which reach from mid-dorsal line to mid-lateral line; an irregular dusky area behind eye which extends to rictus; a dusky area from snout to nostrils; fins paler than body.

I compared my specimens with Jenkins' type. The dentition is the same and the color pattern very similar.

The specimens were collected from lagoon and leeward outer reefs.

Gymnothorax fimbriata

Muraena fimbriata Bennett 1831. Proc. Zool. Soc. London, pt. 1, p. 168. (Type locality, Mauritius).

1 specimen. 80 mm. Onotoa lagoon.

Color in alcohol tan with highly irregular brown markings vertically aligned on body except ventrally anterior to anus; 2 brown spots behind eye and an irregular brown line over top of head behind eye; snout mottled with brown.

Gymnothorax margaritophorus

Gymnothorax margaritophorus Bleeker 1865. Ned. Tijdschr. Dierk., vol. 2, p. 53. (Type locality, Ambon, East Indies).

6 specimens. 160 - 350 mm. Onotoa.

Color in alcohol reddish brown, orange-brown ventrally, with pale spots and blotches on the body, these more distinct caudally (in some specimens the pale blotches are interconnected, and the color pattern would more appropriately be considered as dark blotches on a pale brown ground color); a series of about three to six dark brown elongate blotches behind eye; a pale band mid-dorsally on head running from snout posterior to level of eyes.

G. margaritophorus was collected in coral areas of the lagoon and outer reef.

Gymnothorax flavimarginata

Muraena flavimarginata Rüppell 1828. Atlas Reise nörd. Afrika, Fische Rothen Meers, p. 119, pl. 30, fig. 3. (Type locality, Red Sea).

2 specimens. 320 and 396 mm. 1 specimen. 80 mm. Onotoa.

Color in alcohol orangish brown with a fine mottling of dark brown blotches; gill opening in a black spot (this spot just forming in 80 mm specimen); posterior margins of fins narrowly white (bright green-yellow in life).

The two large specimens were taken from a surge channel on the windward side of the atoll. The 80 mm was collected from a small coral head in a shallow, sandy channel.

Gymnothorax javanica

Muraena javanicus Bleeker 1859. Nat. Tijdschr. Ned.-Ind., vol. 19, p. 347. (Type locality, Java).

2 specimens. 170 and 1000 mm. Onotoa.

Color in alcohol of large specimen reddish brown with numerous irregular black spots and blotches covering head, body, and fins (these blotches of two different sizes, the large ones about the size of a dime or larger and often containing irregular brown areas, the others smaller than size of the eye); no large-sized black blotches on anterior fifth of body except one which encloses gill opening; corner of mouth blackish. In the 170 mm specimen there are only large-sized blotches which are rounder than those of the 1000 mm specimen and extend on to head; also there is narrow pale margin posteriorly on fins.

Smaller javanica have a color pattern similar to G. fimbriata. In the latter the spots are, in general, smaller, more scattered, yet more inclined to co-join with other spots; pale margins extend the whole length of the fins in fimbriata, and the gill opening is not surrounded by a large black blotch.

The dentition of the large specimen compares closely with that given in the diagram for this species by Schultz (1953; fig. 27); the small specimen, however, has several large teeth in an inner row on the maxillary and small teeth interspersed between the large marginal intermaxillary teeth, similar to the pattern for fimbriata.

The large specimen was encountered with its head protruding from a crevice in a coral head near the center of the lagoon. Three spears were shot into its head before it could be pulled from its hole, and even then it was a difficult task.

Gymnothorax undulata

Muraenophis undulatus Lacépède 1803. Hist. nat. poiss., vol. 5, pp. 629, 642, 644, fig. 2.

3 specimens. 240 - 600 mm. Onotoa.

Color from 35 mm Kodachrome transparency of 600 mm specimen chestnut brown anteriorly, dark brown posteriorly, with narrow white lines dividing body color into irregular blocks; anterior half of head with only traces of whitish spots and short lines; gill opening not in a black blotch (though the margin is darker than rest of body); no definite pale margin on fins. In the smaller specimens there is a pale margin posteriorly on the fins, and the pale lines on the body are broader and less irregular; thus the dark brown of the body is more spot-like.

The specimens were secured from both lagoon and seaward reefs.

Gymnothorax buroensis

Muraena buroensis Bleeker 1857. Nat. Tidschr. Ned.-Ind. vol. 13, p. 79. (Type locality, Nova-Selma, Buro, Ambon, and Ceram).

24 specimens. 92 - 245 mm. Onotoa.

Color in alcohol dark brown with numerous close-set black blotches, more or less arranged in bars (posteriorly on body these blotches are so large that the pale areas between are restricted as small spots which tend to form rows); fins with pale margins posteriorly (bright orange in life). Many specimens are almost black, and the color pattern can be perceived only with difficulty.

There are two rows of teeth on the maxillary, the teeth of the inner row being longer. There are three rows of long canines on the intermaxillary in addition to the marginal teeth.

This melanistic eel appeared to be the most abundant species of the genus at Onotoa and was taken from many different habitats.

Gymnothorax (favaginea?)

Gymnothorax favagineus Bloch and Schneider 1801. Systema ichth., p. 525. (Type locality, Tranquebar, India).

1 specimen. 60 mm. Onotoa.

Color in alcohol light brown with large round black spots in a row on the body and a second series of spots dorsally, each spot cut off at edge of dorsal fin.

I assign this tiny juvenile specimen to favaginea mainly on color pattern. The dentition is different than that given by Weber and de Beaufort (1916: 379). There are three rows of three fangs mesially on the intermaxillary which are longer than the lateral series. Smaller teeth extend posteriorly from the first and third rows to meet in the midline at the anterior end of the single row of vomerine teeth.

Gymnothorax moluccensis

Priodonophis moluccensis Bleeker 1864. Atlas ichth., vol. 4, p. 108, pl. 187, fig. 1. (Type locality, Ambon, East Indies).

1 specimen. 300 mm. Onotoa.

Color plain brown, a little darker posteriorly.

Teeth on dentary very finely serrated on posterior edges; two medial canine teeth on intermaxillary, the more posterior one the longest tooth in the jaw (there are sockets, however, for two more, one on either side and slightly anterior to the long tooth); no inner row of maxillary teeth; a single row of short teeth on vomer; roof and floor of mouth finely papillate; eye 1.5 in snout; snout 6.5 in head; fins somewhat elevated, though not as much as described by Schultz (1943: 38) for G. pseudothyrsoidea.

The specimen was taken with rotenone from an area of the outer reef with numerous coral heads at a maximum depth of about 7 feet.

Gymnothorax bikiniensis

Gymnothorax bikiniensis Schultz in Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, pp. 109, 116, figs. 23 e, 24. (Type locality, Bikini Atoll, Marshall Islands).

1 specimen. 263 mm. Onotoa surge channel.

Color in alcohol brown (under a dissecting microscope one can see a fine mottling of light and dark brown); edges of fins a little paler than body; snout darker than lower jaw. I have in my field data a note on the color in life which reads, "Narrow dendritic vertical dark brown bars on a dusky greenish yellow background. Snout and anus dark; belly pale." I can find no evidence of bars on the preserved specimen.

The specimen was compared with Schultz' type.

This species resembles Enchelynassa canini especially in dentition, and may form the basis for considering the genus Enchelynassa a synonym of Gymnothorax.

Gymnothorax thyrsoidea

Muraena thyrsoidea Richardson 1844. Zool. voyage "Sulphur", Fishes, p. 111. (Type locality, China Seas and Canton).

Lycodontis thyrsoidea Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 52. (Abaiang, Kingsmill Islands).

2 specimens. 70 and 155 mm. Onotoa.

Color in life white; in alcohol, light brown.

The teeth are short and conical, none of them being long and fang-like as in most species of Gymnothorax; two stout medial teeth on the intermaxillary, one behind the other in the mid-line; two rows of short teeth on vomer which join posteriorly to a single row; Snout 6 in head; eye 1.4 in snout.

Richardson's specimens were brown with a reticulation of white lines. My specimens are everywhere pale and may thus be distinct from thyrsoidea. Because of the similarity in dentition, however, I prefer to consider the Onotoa ones a color variant. In view of their small size, they may be exhibiting juvenile coloration.

Gymnothorax sp.

3 specimens. 190 - 220 mm. Onotoa lagoon.

Color in alcohol light yellowish brown with a dense reticulation of slightly browner, highly tortuous lines.

Maxillary teeth in one row (a single inner tooth in two of the specimens); three elongate canines in mid-line of intermaxillary; a single row of vomerine teeth; six inner elongate canines in two rows anteriorly on dentary; snout 5.8 in head length; eye 1.6 in snout; origin of dorsal fin 1 to 2 snout lengths anterior to gill opening.

I am unable to identify this species.

Genus UROPTERYGIUS

Uropterygius Rüppell 1835. Neue Wirbelth., Fische, p. 83. (Type species, Uropterygius concolor Rüppell).

Uropterygius concolor

Uropterygius concolor Rüppell 1835. Neue Wirbelth., Fische, p. 83, pl. 20, fig. 4. (Type locality, Red Sea).

4 specimens. 100 - 140 mm. Onotoa lagoon.

1 specimen. 185 mm. Tarawa.

Color in alcohol uniform light brown; four mucous pores on side of upper jaw posterior to anterior nostril, their margins slightly paler than rest of head.

Two rows of maxillary teeth those of the inner row much longer than the outer and well-spaced; one row of short, stout vomerine teeth; two large canine teeth in mid-line on intermaxillary; snout 5 in head length; eye 1.9 in snout; center of eye slightly closer to rictus than tip of snout; posterior nostril above center of eye and with a slightly elevated rim; distance from tip of snout to anus contained 2.2 times in total length.

Uropterygius sp.

1 specimen. 184 mm. Onotoa lagoon.

Color in alcohol uniform light brown; rims and interior of four mucous pores on side of upper jaw behind anterior nostril pale.

A single row of about ten teeth on maxillary which project backward at about a 45 degree angle; a cluster of about four stout teeth on median part of intermaxillary, the most posterior and median one the longest; no teeth visible on vomer; anterior nostril tubular; posterior nostril with a slightly elevated rim, located above center of eye, and followed by a depression in the head; distance from tip of snout to anus 2.1 in total length; distance from tip of snout to rictus 2.7 in head length (to gill opening); snout length 4.8 in head length; eye 2.2 in snout length.

This specimen was not distinguished from U. concolor until the teeth were examined. I follow Schultz in considering the above species, and not this one, U. concolor.

Uropterygius xanthopterus

Uropterygius xanthopterus Bleeker 1859. Nat. Tijdschr. Ned.-Ind., vol. 19, p. 350. (Type locality Java and Ambon, East Indies).

20 specimens. 125 - 350 mm. Onotoa.

Color in alcohol dark brown, mottled with darker brown, with numerous tiny white spots, most evident on head and anterior part of body; margin of tail broadly pale orangish.

Sixteen of the specimens were collected from the lagoon side of the west reef in from 6 to 8 feet of water. The remaining four were from the outer reef.

Uropterygius marmoratus

Gymnomuraena marmorata Lacépède 1803. Hist. nat. poiss., vol. 5, pp. 648, 649. (Type locality, New Britain).

1 specimen. 380 mm. Tarawa.

Color in alcohol light brown, mottled with blackish patches, and this overlain with numerous black spots (mostly larger than diameter of eye) which tend to be larger dorsally than ventrally; nostrils blackish.

Uropterygius supraforatus

Gymnomuraena supraforata Regan 1909. Ann. Mag. Nat. Hist., ser. 8, vol. 4, p. 439. (Type locality, Savay and Tahiti).

4 specimens. 170 - 250 mm. Onotoa lagoon.

Color in life light greenish gray with about 5 rows of irregular brown blotches which are slightly larger posteriorly than anteriorly (average size about equal to size of eye) (posteriorly on body the blotches tend to join vertically to form irregular bars); spots on head not arranged in rows and of a size about equal to size of pupil; a slight bluish cast over abdomen.

Numerous sharp elongate teeth in jaws, the longest maxillary teeth being the innermost of many rows; a single row of long teeth on vomer, continuous with teeth on midline of intermaxillary.

Uropterygius micropterus

Muraena micropterus Bleeker 1852. Nat. Tijdschr. Ned.-Ind., vol. 3, p. 298. (Type locality, Flores, Buro, Morotai, Ambon, Ceram, Aru, and Timor).

3 specimens. 210 - 245 mm. Onotoa.

Color in life light grayish, almost white ventrally, with a fine reticulation of small blackish dendritic blotches.

Two rows of teeth on the maxillary, the teeth of the inner row about four times longer than those of the outer; a single row of long teeth on the vomer; eye slightly closer to end of snout than rictus; diameter of eye contained 1.9 in length of snout.

The specimens were collected by hand from beneath exposed rocks on the outer reef flat.

Uropterygius macrocephalus

Gymnothorax macrocephalus Bleeker 1865. Ned. Tijdschr. Dierk., vol. 2, p. 54. (Type locality, Ambon, East Indies).

1 specimen. 200 mm. Onotoa lagoon.

Color in life light gray-brown, with reticular white blotches in irregular bars along side of body; end of caudal fin whitish: posterior nostril above center of eye, rim slightly elevated, interior pale; anterior nostril brown, like rest of snout.

Two rows of teeth on maxillary, those of the inner row close-set and about one-fourth to one-third as long as the well-spaced teeth of the inner row: a single row of 7 teeth on vomer; three rows of 2 teeth each on median part of intermaxillary, those of the middle row the longest; two rows of teeth on dentary, similar to those on maxillary; no elongate canines anteriorly on dentary; snout contained 7 times in head length; eye 1.8 in snout; center of eye closer to tip of snout than corner of mouth; distance from snout to anus 2.3 in total length.

Genus RABULA

Rabula Jordan and Davis 1888. Rep. U. S. Comm. Fish. and Fisheries, vol. 16, pp. 590, 598. (Type species, Rabula davisi Fowler).

Rabula fuscomaculata

Rabula fuscomaculata Schultz in Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, pp. 139, 147, fig. 30. (Type locality, Rongerick Atoll, Marshall Islands).

3 specimens. 120 - 160 mm. Onotoa.

Color in alcohol light brown with numerous dark brown spots about the size of the eye covering body and fins (anteriorly these spots are smaller and indistinct); mucous pores on side of upper jaw (and to a lesser extent those of the lower jaw) broadly outlined with white.

The Onotoa specimens were compared with the holotype in the United States National Museum and found to be the same.

Two of the specimens were collected on the lagoon side of the west reef and the third on the outer reef in the northernmost part of the atoll. In each case the depth of the water was about 8 feet.

Family OPHICHTHIDAE

The snake eels are sand dwellers and often occur in areas where few other fishes are found. Usually a large amount of rotenone is needed to poison them. There was not sufficient rotenone on hand at Onotoa to warrant its use for ophichthids alone; thus only one species was taken. A large specimen of another species, probably either Myrichthys colubrinus (Boddaert) or Myrichthys bleekeri Gosline, was seized in ankle-deep water on a tidal flat zone of the lagoon, but it escaped, as snake eels are prone to do.

The specimens from Tarawa and Abemama were collected by R. Catala.

Genus MYRICHTHYS

Myrichthys Girard 1859. Proc. Acad. Nat. Sci. Phila., p. 58. (Type species, Myrichthys tigrinus Girard).

Myrichthys maculosus

Muraena maculosa Cuvier 1817. Règne animal, vol. 2, p. 232. (Type locality, European seas).

1 specimen. 241 mm. Onotoa.

Color in life pale greenish yellow on back, shading to whitish on sides and ventrally, with 31 round black spots (not all the spots are in alignment with ones on the other side) a black saddle on head over both eyes; 4 elliptical black marks on chin at level of eye.

The single specimen was taken with rotenone from a sandy region of about 8 foot depth between coral heads on the outer reef in the northernmost part of the atoll.

Myrichthys colubrinus

Muraena colubrina Boddaert 1781. Neue Nord. Beytr., vol. 2, p. 56, pl. 2, fig. 3. (Type locality, Ambon, East Indies).

1 specimen. 290 mm. Abemama.

Color in alcohol brown with 32 semicircular black saddles in line on body and 2 such saddles on head between gill opening and eye (these saddles are twice as broad dorsally as intervening pale areas; they do not extend into dorsal fin and reach to or slightly below the lateral line).

Snout pointed and flattened dorso-ventrally; length of snout 6.5 in head length (to gill opening); pectoral 5 in head length; eye 2 in length of pectoral.

I am uncertain of the use of the name colubrinus for this specimen. It has been returned to the Australian Museum.

Genus LEIURANUS

Leiuranus Bleeker 1853. Verh. Batav. Genootsch., vol. 25, p. 36. (Type species, *Leiuranus lacepedei* Bleeker).

Leiuranus semicinctus

Ophisurus semicinctus Lay and Bennett 1839. Zool. Capt. Beechey's voyage, Fishes, p. 66, pl. 20, fig. 4. (Type locality, Oahu).

1 specimen. 580 mm. Tarawa.

Color in alcohol brown with 31 narrow black bars on the body which extend up into dorsal fin but which do not meet ventrally (the posterior end of the body is blunt and it is believed that the hind section of the body was lost during life; the maximum body depth of the specimen is 12 mm); maximum width of black bars contained nearly 4 times in width of pale interspaces; head which 1 such bar between gill opening and eye; a black saddle over interorbital space with bifurcates at upper edge of eye, one limb extending anteroventrally to mouth, the other forming a spot adjacent to posteroventral edge of eye; black spots on chin.

Length of snout contained 6 times in length of head to gill opening; diameter of eye 2.2 in snout; length of pectoral fin nearly equal to diameter of eye.

Genus CALLECHELYS

Callechelys Kaup 1856. Cat. apodal fish in collection of British Mus., p. 51. (Type species, *Callechelys guichenoti* Kaup).

Callechelys melanotaenia

Callechelys melanotaenia Bleeker 1864. Atlas ichth...., vol. 4, p. 66, pl. 193, fig. 2. (Type locality, Ambon, East Indies).

Callechelys melanotaenia Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 43. (Abemama, Gilbert Islands).

Genus MURAENICHTHYS

Muraenichthys Bleeker 1853. Nat. Tijdschr. Ned.-Ind., vol. 4, p. 505. (Type species, *Muraenichthys gymnopterus* Bleeker).

I follow Myers and Storey (*Stanford Ichth. Bull.*, vol. 1, 1939: 157) and Gosline (*Pacific Sci.*, vol. 4, 1950: 313) in considering the genus *Muraenichthys* as belonging in the Ophichthidae.

Muraenichthys gymnotus

Muraenichthys gymnotus Bleeker 1864. Atlas ichth...., vol. 4, p. 33. (Type locality, Ambon, East Indies).

8 specimens. 103 - 121 mm. Onotoa.

Color in alcohol light brown; scattered, tiny, dark brown flecks dorsally on body and on head, the most pronounced accumulation being on head posterior to eye.

Anterior nostril tubular, directed antero-ventrally from front part of upper lip at base of proboscis-like end of snout; posterior nostril with an elongate flap at front edge which hangs downward from upper lip just anterior to eye; teeth short and inconspicuous; vomerine teeth in two, close-set, irregular rows (hence appearing as single narrow band); maxillary and dentary teeth in a narrow band, usually no more than two teeth in width; origin of dorsal fin slightly anterior to anus; snout moderately pointed; anterior edge of eye about equidistant between rictus and tip of snout; eye about 3 in snout length; distance from tip of snout to rictus contained about 3.7 times in length of head.

The specimens were not distinguished in the field from Muraenichthys laticaudata. Labels were mixed, therefore there are no reliable locality data.

Muraenichthys laticaudata

Myropterura laticaudata Ogilby 1897. Proc. Linn. Soc. N. S. Wales, vol. 22, p. 247. (Type locality, Fiji).

5 specimens. 91 - 120 mm. Onotoa.

Color in alcohol uniform brown; median fins light brown.

Nostrils as in preceding species except posterior nostril lacks a projecting flap and is not visible in lateral view; teeth moderately conspicuous, about twice as long as those of the preceding species; vomerine teeth uniserial; maxillary teeth in two rows; teeth on dentary in a single row; origin of dorsal fin slightly posterior to anus; snout blunt, its length contained about 5 times in head length; posterior edge of eye only slightly anterior to rictus; diameter of eye about 3 in snout length; distance from tip of snout to rictus contained about 4 times in head length; body depth at anus 36 to 43 in total length.

Family MORINGUIDAE

In the classification of the worm eels I have followed Gosline and Strasburg, "The Hawaiian fishes of the family Moringuidae: another eel problem", in press, Copeia, 1955.

Genus MORINGUA

Moringua Gray 1831. The illustrations of Indian zoology... Hardwicke, vol. 1, pt. 5, pl. 95. (Type species, Moringua raitaborua Cantor).

Moringua macrochir

Moringua macrochir Bleeker 1855. Nat. Tijdschr. Ned.-Ind., vol. 9, p. 71. (Type locality, Batu).

5 specimens. 88 - 285 mm. Onotoa.

Pores in lateral line from gill opening to near end of body (not including vestigial pores which are closely spaced at extreme end of body) 103 to 109. (3 specimens).

Color in alcohol uniform light yellowish brown.

The following proportional measurements from a 280 mm. specimen: body depth contained 47 times in total length; distance from tip of snout to rictus 4.6 in head length; snout 6.4 in head length; eye about 6 in snout; pectoral fin about the size of the eye.

Lower jaw projects anterior to upper jaw; caudal fin slightly pointed; a single row of teeth on maxillary; a single row of vomerine teeth; six prominent canines on intermaxillary; posterior nostril located immediately anterior to eye.

The specimens were secured with rotenone from sandy areas of both the lagoon and outer reef.

Moringua javanica

Aphthalmichthys javanicus Kaup 1865. Cat. apodal fish in collection British Mus., p. 105, fig. 71. (Type locality, Java).

2 specimens. 510 and 740 mm. Onotoa.

Pores in lateral line from gill opening to near end of body 139. (1 specimen).

Color in alcohol light grayish brown.

The following proportional measurements from the 510 mm specimen: body depth contained 78 times in total length; distance from tip of snout to rictus contained 5.8 times in head length; snout about 8 in head length; eye about 7 in snout length; pectoral fin tiny, its length equal to about one-half the diameter of the eye.

Lower jaw projects anterior to upper jaw; caudal fin slightly pointed; dentition and nostrils similar to above.

One specimen was collected from a shallow channel between islets and the other from a surge channel.

Moringua sp.

1 specimen. 390 mm. Onotoa.

Number of lateral line pores on posterior 155 mm. of body 17 (difficult to count anterior to this because of twisting of the body); thus the total number of pores to the gill opening is estimated at 40.

Color in alcohol yellowish brown.

Body depth 52 in total length; distance from tip of snout to rictus contained 4 times in head length; snout about 7 in head length; eye about 4.7 in snout length; pectoral fin about the size of the eye.

Lower jaw projects anterior to upper jaw; caudal fin pointed; teeth similar to above two species except they are directed more sharply backward.

I am unable to identify this moringuid to species. It appears to be distinct in its low pore count and moderately stout body.

The specimen was collected from a protected outer reef area.

Family AULOSTOMIDAE

Genus AULOSTOMUS

Aulostomus Lacépède 1803. Hist. nat. poiss., vol. 3, p. 356. (Type species, *Aulostomus chinensis* Lacépède = *Fistularia chinensis* Linnaeus).

Aulostomus chinensis

Fistularia chinensis Linnaeus 1766, Syst. nat., ed. 12, p. 515. (Type locality, India).

1 specimen. 300 mm. Onotoa.

D XII, 27; A 30; V 6; P 16; lateral line scales 260.

Color in life brown, becoming abruptly black posterior to origin of soft dorsal and anal fins (this black area with linearly-arranged light brown spots or elongate blotches, mostly in 2 rows which continue on to caudal peduncle); maxillary with an elongate black blotch; anus black; soft dorsal reddish, black anteriorly and basally; anal fin reddish, black basally; caudal fin yellow with a black spot in the upper central part of the fin; ventral fins with a black spot basally.

The trumpet fish was not common at Onotoa, with only 2 specimens being seen. One of these was speared for the collection at a depth of 12 feet in the lagoon.

Family FISTULARIIDAE

Genus FISTULARIA

Fistularia Linnaeus 1758. Syst. nat., ed. 10, p. 312. (Type species, Fistularia tabacaria Linnaeus).

Fistularia petimba

Fistularia petimba Lacépède 1803, Hist. nat. poiss, vol. 5, pp. 349, 350 (pl. 18, fig. 3, in vol. 2). (Type locality, New Britain; Union Island).

Fistularia depressa Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 287 (Nauru and Ocean Island).

2 specimens. 130 and 530 mm. Onotoa.

2 specimens. 159 and 403 mm. Tarawa.

Fin ray counts of 530 mm specimen: D 14; A 13; P 15; V 6.

The cornet fish was occasionally sighted in the Onotoa lagoon. The 530 mm specimen was speared in water of about 4 foot depth over an eel grass (Thalassia) flat. It was a dark forest green in color and matched its surroundings well. On being speared it immediately flashed its body color to light gray. The 130 mm specimen was caught by hand from a shallow outer reef flat tide pool at low tide.

Family SYNGNATHIDAE

The Onotoa pipefishes were identified by Earl S. Herald, to whom I am very grateful.

Genus CORYTHOICHTHYS

Corythoichthys Kaup 1853. Arch. Naturg., vol. 19, pt. 1, p. 231. (Type species, Syngnathus fasciatus).

Corythoichthys flavofasciatus conspicillatus

Syngnathus conspicillatus Jenyns 1842. Zool. voyage "Beagle", Fish, p. 147, pl. 27, fig. 4. (Type locality, Tahiti).

5 specimens (4 female, 1 male). 56 - 81 mm. Onotoa.

2 specimens (female). 58 and 62 mm. Abemama.

Color in alcohol light tan with dendritic brown blotches in a row on the side and in line with a similar row on dorsal surface of trunk; a horizontal brown line from middle of posterior margin of eye to pectoral, a portion curving dorsally on opercle; a similar line extending posteriorly from lower edge of eye, and anteriorly on to snout as a row of elongate spots; anal region of male with a large blue spot, of female whitish. In life the male had short yellow lines across the back and a bright red caudal fin; the females had a red spot on the caudal fin.

Genus DORYRHAMPHUS

Doryrhamphus Kaup 1856. Cat. lophobranchiate fishes British Mus., p. 585. (Type species, *Doryrhamphus excisus* Kaup).

Doryrhamphus melanopleura melanopleura

Syngnathus melanopleura Bleeker 1858. Nat. Tijdschr. Ned.-Ind., vol. 15, p. 464. (Type locality, Cocos Islands, Indian Ocean).

2 specimens (female). 33 and 45 mm. Onotoa.

Color in life brilliant orange with a median black line from snout to base of caudal fin and irregular black markings on caudal fin.

Family BELONIDAE

Genus BELONE

Belone Cuvier 1817. Règne animal, ed. 1, p. 185. (Type species, *Esox belone* Linnaeus).

Belone platyura

Belone platyura Bennett 1831. Proc. Zool. Soc. London, pt. 1, p. 168. (Type locality, Mauritius).

Platybelone platura Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 287. (Nauru and Ocean Island).

8 specimens. 215 - 280 mm (rictus to base of caudal). Onotoa.

1 specimen. 270 mm. Tarawa.

1 specimen. 188 mm. Nukunau.

D 13 or 14; A 17 or 18; P 12. (5 specimens). Gill rakers (including all rudiments) 25 or 26. (2 specimens).

Color from 35 mm Kodachrome transparency: back blue, sides and ventral part of body silvery.

Teeth in jaws of approximately the same size; width of body slightly greater than depth; width of body contained about 14 times in length from rictus to base of caudal fin; caudal peduncle on each side with a prominent lateral scaly keel which extends out on central part of caudal fin; least depth of caudal peduncle half as wide as width; greatest diameter of eye 1.7 to 1.9 in postorbital length of head.

All of the Onotoa specimens were taken in outer reef areas. The Gilbertese often caught this species at night by wading on the outer reef flat with a torch and striking the backs of the fish with a long sharp knife or stick as they were attracted to the light.

The stomachs of two specimens taken at night on the outer reef flat contained fragments of unidentified red crustaceans. Of five poisoned with rotenone during the day, four were empty and one had recently eaten a small fish.

Genus STRONGYLURA

Strongylura van Hasselt 1823. Alg. Konst. Letterbode, no. 35; 1824. Bull. Sci. Nat. (Férussac), vol. 2, p. 374. (Type species, Strongylura caudimaculata van Hasselt = Belone strongylura van Hasselt).

Strongylura incisa

Belone incisa Cuvier and Valenciennes 1846. Hist. nat. poiss., vol. 18, p. 451. (Type locality, Indian Ocean).

1 specimen. 310 mm (from rictus to base of caudal). Tarawa.

D 18; A 22; P 12.

Gill rakers rudimentary, with only 9 perceptible near angle of first arch; teeth in jaws of two different sizes, the long canines being 4 to 5 times longer than the numerous short teeth lying between the canines; canine teeth vertical or angling slightly backwards in jaws; no well-developed keel on side of caudal peduncle; least depth of caudal peduncle about equal to width of peduncle at this point; lateral line ends ventral to mid-lateral point of caudal peduncle at its least depth; greatest diameter of eye 2.3 in post-orbital length of head.

Family HEMIRAMPHIDAE

Genus HEMIRAMPHUS

Hemi-Ramphus Cuvier 1817. Règne animal, ed. 1, vol. 2, p. 186. (Type species, Esox brasiliensis Linnaeus).

Hemiramphus marginatus

Esox marginatus Forskål 1775. Descr. animalium, p. 67. (Type locality, Djedda, Red Sea).

1 specimen. 215 mm. Onotoa.

1 specimen. 198 mm. Tarawa.

D 13; A 12; P 12; transverse scale rows from gill opening to base of caudal fin 51; gill rakers 43. (1 specimen).

Inner pelvic ray decidedly longer than other rays; upper jaw without scales; body in cross-section less angular than Hyporhamphus; length of lower jaw anterior to tip of upper jaw contained 3.4 times in body length from tip of upper jaw to base of caudal fin; eye 4.2 in head length; depth of body 5.7 in standard length; length of pectoral fin 4.7 in standard length.

The Onotoa specimen was captured with a dip net at night at the surface in deep water west of the atoll. It was attracted to a canoe with the light of a torch.

Genus HYPORHAMPHUS

Hyporhamphus Gill 1859. Proc. Acad. Nat. Sci. Phila., p. 131. (Type species, Hyporhamphus tricuspidatus Gill = Hyporhamphus unifasciatus Ranzani).

Hyporhamphus laticeps

Hemirhamphus laticeps Günther 1866. Cat. fishes British Mus., vol. 6, p. 267. (Type locality, Fiji Islands).

12 specimens. 57 - 235 mm. Onotoa.

4 specimens. 78 - 220 mm. Tarawa.

D 14 or 15; A 14 or 15; P 12; transverse scale rows from gill opening to base of caudal fin 56 to 59; gill rakers 40 to 42. (5 specimens).

Color in life of specimens 180 to 244 mm in length: dorsal part of body to lateral line bright metallic blue; lateral line dark blue; sides and belly silvery; caudal fin bluish; remaining fins hyaline; tip and underside of lower jaw bright red.

Depth of body about equal to width; body depth of 244 mm specimen about 9 in standard length; width of upper jaw about 1.5 times longer than length of jaw; lower jaw of 244 mm specimen extends 52 mm beyond tip of upper jaw.

During the course of an afternoon poison station just beyond the breaker line on the southwest side of Aunteuma, a small island in the northern part of Onotoa Atoll, many large specimens of this species were seen at the surface swimming in and out of the cloud of rotenone. Over 15 were killed. The stomachs of 10 of these were opened but found to be empty except for a small amount of thick, cream-colored liquid.

Hyporhamphus dussumieri

Hemiramphus dussumieri Cuvier and Valenciennes 1846. Hist. nat. poiss., vol. 19, p. 33, pl. 554. (Type locality, Seychelles).

?Hemiramphus affinis Kendall and Goldsborough 1911. Mem. Mus. Comp. Zoöl., vol. 26, p. 251. (Tarawa).

8 specimens. 65 - 162 mm. Onotoa.

D 15 or 16; A 15 or 16; P 12; transverse scale rows from gill opening to base of caudal fin 65 or 66; gill rakers 34 to 36. (3 specimens).

Depth of body greater than width; greatest depth of body about 10 in standard length; greatest width of body 12.5 in standard length; lower jaw of 162 mm specimen extends 39 mm beyond tip of upper jaw; maximum width of upper jaw greater than length.

This species was taken both in surface waters of the lagoon and the outer reef.

Hyporhamphus georgii

Hemiramphus Georgii Cuvier and Valenciennes 1846. Hist. nat. poiss., vol. 19, p. 27, pl. 555. (Type locality, Mahe Bay, Coromandel).

Hemiramphus (Rhynchorhamphus) georgii Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 75. (Kingsmill Islands).

I do not believe Fowler (1928: 75) is justified in setting up the subgenus Rhynchorhamphus for this species. His primary basis for the subgenus was the very long lower jaw. The relative length of the jaw of half beaks varies with age.

Family EXOCOETIDAE

The flying fishes were caught at night by participating with Gilbertese natives who catch these fishes with long-handled dip nets after attracting them with the light of torches. The fishing is done from outrigger canoes while under sail. The Onotoa exocoetids were all caught outside of the lagoon, though I was told that fishing for flying fishes is at times undertaken in the lagoon. The general Gilbertese name for flying fishes is Teonauti.

The meristic data for all of the specimens are given in Table 1. Apparently scale counts are variable within the species.

Fowler (1928: 80) identified a specimen in the Museum of Comparative Zoology from the Kingsmill Islands as Evolantia microptera (Valenciennes).

Genus CYPSELURUS

Cypsilurus Swainson 1838. Nat. hist. class. fishes, amphibians,..., vol. 1, p. 299. (Spelling changed to Cypelurus Lowe 1841 by the International Commission on Zoological Nomenclature).

Cypselurus spilonotopterus

Exocoetus spilonotopterus Bleeker 1866. Ned. Tijdschr. Dierk., vol. 3, p. 113. (Type locality, Padang, Sumatra).

2 specimens. 267 and 273 mm. Onotoa.

Color from 35 mm Kodachrome transparency: upper one-third of body gun metal blue, lower two-thirds silvery white; a large black area in dorsal fin from the third to the tenth ray; caudal fin dark purplish; pectoral fin dark purplish with a silvery sheen centrally; anal and pelvic fins white. In alcohol the pectoral membranes are blackish except extreme outer portions which are hyaline.

Cypselurus unicolor

Exocoetus unicolor Cuvier and Valenciennes 1846. Hist. nat. poiss., vol. 19, p. 97. (Type locality, Vanikoro and Java).

2 specimens. 230 and 265 mm. Onotoa.

Color in alcohol: upper half to third of body dark gray-brown, lower part of body light tan; horizontal area from gill opening to pelvic fins at level of lower base of pectoral fin with a sparse stippling of tiny black dots; dorsal, anal, pectoral, and pelvic fins pale; caudal fin brownish; outer axil of pelvic fins blackish.

Cypselurus suttoni

Maculocoetus suttoni Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 288, pl. 14, fig. 1. (Type locality, Nauru and Ocean Island).

2 specimens. 253 and 267 mm. Onotoa.

Color in alcohol: upper half of body dark gray brown, lower half tan; dorsal fin brown with a large black spot on the fifth to tenth rays; pectoral fin membranes hyaline brown with black spots; caudal fin light brownish; pelvic fins pale.

Genus PROGNICHTHYS

Prognichthys Breder 1928. Bull. Bingham Oceanogr. Coll., vol. 2, p. 20. (Type species, Exocoetus gibbifrons Cuvier and Valenciennes).

Prognichthys albimaculatus

Cypselurus (Exonautes) albimaculatus Fowler 1933. (on Cypselurus speculiger Kendall and Goldsborough, 1911). Proc. Acad. Nat. Sci. Phila., vol. 85, p. 327, fig. 81. (Type locality, Guam).

1 specimen. 165 mm. Tarawa.

Color in alcohol: upper half of body dark gray-brown, lower half tan; dorsal and caudal fins light brownish; pectoral fin membranes blackish, especially lower outer portions, (except center of fin which is light dusky); anal and pelvic fins pale like ventral half of body.

Unlike Cypselurus in which only the upper pectoral ray is branched, Prognichthys has the upper two pectoral rays unbranched. Also, the anal and dorsal fins in Prognichthys are about the same length at their base and have about the same number of rays. In Cypselurus the dorsal fin base is longer and there are more rays than the anal. In my single specimen of *Prognichthys albimaculatus* (and in the type which was examined by me) the anal fin takes its origin just beneath the origin of the dorsal fin.

Table 1 Counts Made on the Exocoetidae Collected in the Gilbert Islands

	Dorsal rays					Anal rays	
	10	11	12	13	14	9	10
C. spilonotopterus				2			2
C. unicolor			1	1		1	1
C. suttoni				1	1		2
P. albimaculatus	1						1

	Gill rakers						Pectoral rays					
	20	21	22	23	24	25	13	14	15	16	17	18
C. spilonotopterus		2					2					
C. unicolor	1		1					1	1			
C. suttoni		1			1		2					
P. albimaculatus						1						1

	Scale rows from upper end of gill opening to base of caudal fin											
	44	45	46	47	48	49	50	51	52	53	54	55
C. spilonotopterus					1		1					
C. unicolor	1					1						
C. suttoni									1			1
P. albimaculatus					1							

	Predorsal scales											
	28	29	30	31	32	33	34	35	36	37	38	39
C. spilonotopterus					1							1
C. unicolor	1					1						
C. suttoni									1	1		
P. albimaculatus			1									

Family HOLOCENTRIDAE

The squirrel fishes are well represented among the collections from the Gilbert Islands. They are spiny, usually red, with large eyes, a pelvic fin formula of I,7, and nocturnal habits. The Gilbertese valued them as food fish and caught them while fishing with torches at night.

Genus HOLOCENTRUS

Holocentrus Scopoli 1777. Introductio ad historiam naturalem..., p. 449. (No type species designated, but after Gronow's *Holocentrus maxilla*).

Holocentrus spinifer

Sciaena spinifera Forskål 1775. Descr. animalium, pp. 12, 49. (Type locality, Red Sea).

1 specimen. 222 mm. Onotoa.

2 specimens. 150 and 170 mm. Tarawa.

D XI-15; A IV,10; P 15; lateral line scales 44. (1 specimen).

Spine at corner of preopercle long, its length measured to center of the corner 3.3 in head length; profile of head very slightly concave.

Color from 35 mm Kodachrome transparency red; each body scale with a narrow white outer edge; extreme ventral part of body white; spinous dorsal fin bright red; soft dorsal fin light red; caudal fin red except distal part which shades to orange; anal and pectoral fins orange yellow; pelvic fins red with a white margin.

Although the only specimen from Onotoa was taken from an outer reef area, the species was otherwise seen only in relatively shallow areas of the lagoon hiding in interstices in dead coral.

Holocentrus opercularis

Holocentrum operculare Cuvier and Valenciennes 1831. Hist. nat. poiss., vol. 7, p. 501. (Type locality, Carteret Harbor, New Ireland).

3 specimens. 185 - 192 mm. Onotoa.

D X-I,13; A IV,9; P 14; lateral line scales 40. (2 specimens).

Color in alcohol light brown, darker dorsally, with the centro-basal part of each scale dark brown; a broad, uninterrupted, jet black band in spinous dorsal fin; outer part of each interspinous membrane and an irregular pale blotch near base of each membrane pale; remaining fins light brown except upper and lower parts of caudal fin which are slightly dusky.

The three specimens were taken in poison station number II at the northern part of the atoll.

Holocentrus sammara

Sciaena sammara Forskål 1775. Descr. animalium, pp. 12, 48. (Type locality, Djedda, Red Sea).

28 specimens. 31 - 123 mm. Onotoa.

1 specimen. 155 mm. Tarawa.

D X-I,12; A IV,8; P 13 or 14; lateral line scales 41 and 42. (2 specimens).

Color in alcohol light brown with a row of close-set, dark brown spots down the center of each scale row (the rows of spots in many of the specimens are faint); a round, jet black spot anteriorly in dorsal fin (between the first and fourth spines); a light dusky band in middle of fin posterior to black spot; anterior margin of soft dorsal fin, upper and lower lobes of caudal fin, and region of fourth anal spine and first soft ray dusky.

Specimens were collected from both the lagoon and outer reef areas.

Holocentrus laevis

Holocentrum laeve Günther 1859. Cat. fishes British Mus., vol. 1, p. 47. (Type locality, Louisiade Archipelago; Guadalcanal, Solomon Islands; Ambon, East Indies).

11 specimens. 30 - 138 mm. Onotoa.

D X-I,12; A IV,8; P 12; lateral line scales 41. (2 specimens).

Color from 35 mm Kodachrome transparency: silvery blue dorsally, shading to white on sides and ventrally, with a row of dark brown spots down the center of each row of scales; spinous dorsal fin yellowish with a faint dusky lengthwise band in outer part of fin; soft dorsal fin whitish except anterior margin which is dusky red; caudal fin whitish with upper and lower margins broadly dark reddish brown; anal fin whitish except region of last anal spine and first anal ray which is dusky red; pelvic fins white; pectoral fins hyaline.

Specimens were collected from around coral heads in shallow areas of the lagoon, channels, and outer reef.

Holocentrus diadema

Holocentrus diadema Lacépède 1802. Hist. nat. poiss., vol. 4, pp. 335, 372. (Type locality, South Seas).

8 specimens. 47 - 108 mm. Onotoa lagoon.

1 specimen. 110 mm. Tarawa.

D XI,13; A IV,9; P 14; lateral line scales 48. (2 specimens).

Color in alcohol light brown with a pale line narrowly bordered with brown in the center of each scale row; an indistinct elongate brown patch on back beneath posterior part of spinous dorsal fin; membranes of spinous dorsal fin black (spines hyaline), with a narrow lengthwise pale band running from base of first spine to one-fourth up on sixth spine and a similar band from two-thirds out on seventh spine to juncture of spinous and soft dorsal fins; remaining fins pale.

Holocentrus lacteoguttatus

Holocentrum lacteo-guttatum Cuvier and Valenciennes 1829. Hist. nat. poiss., vol. 3, p. 214. (Type locality, Mer des Indes).

11 specimens. 46 - 120 mm. Onotoa.

1 specimen. 39 mm. Tarawa.

D XI-13 or 14; A IV,9; P 15; lateral line scales 44 to 48. (4 specimens).

Color from 35 mm Kodachrome transparency: body silvery; scales on dorsal third of body margined with red and dotted with fine brown spots; dorsal part of head red; outer third of spinous dorsal fin bright red, the rest pale; remaining median fins light red; paired fins whitish.

Ten of the specimens were taken with rotenone from a surge channel of the outer reef on the windward side of the atoll; one specimen was taken from the lagoon side of the west reef.

Holocentrus violaceus

Holocentrum violaceum Bleeker 1853. Nat. Tijdschr. Ned.-Ind., vol. 5, p. 335. (Type locality, Ambon, East Indies).

2 specimens. 158 and 166 mm. Onotoa.

D XI,14; A IV,9; P 15; lateral line scales 35. (2 specimens).

Spine at corner of preopercle very long, its length 2.8 in head length; spinous dorsal fin short, longest dorsal spine 2.7 in head length.

Color in life reddish brown. Color in alcohol dark brown, each body scale with two indistinct pale spots, one in upper central part of scale, the second in lower central part; opercular membrane dark brown, almost black in dorsal portion; fins light brown.

The specimens were taken from coral rich areas, one from the west reef of the atoll and the other from the northern outer reef.

Holocentrus microstomus

Holocentrum microstoma Günther 1859. Cat. fishes British Mus., vol. 1, p. 34. (Type locality, Ambon, East Indies).

13 specimens. 43 - 134 mm. Onotoa.

D XI-12 or 13; A IV,9; P 15; lateral line scales 50 or 51. (5 specimens).

Third anal spine very long, its length about 1.3 in head length; maxillary ends at a vertical passing through anterior one-fourth of eye.

Color from 35 mm Kodachrome transparency: body red with a broad white band down the center of each scale row; head red except ventrally and margin of preopercle which are white; median fins light red; pelvic fins whitish; pectoral fins hyaline.

One 132 mm specimen is more melanistic than the others, with streaks of blackish pigment in the soft dorsal and anal fin. It has only 47 lateral line scales. In other respects it appears like the other specimens of H. microstomus.

Most of the specimens were taken from around coral heads in shallow lagoon and channel areas.

Holocentrus tiere

Holocentrum tiere Cuvier and Valenciennes 1829. Hist. nat. poiss., vol. 3, p. 202. (Type locality, Tahiti).

Holocentrus erythraeus Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 289. (Ocean Island) (after Holocentrus erythroeus Waite, 1903: 3).

10 specimens. 120 - 195 mm. 5 specimens 38 - 49 mm. Onotoa.

2 specimens. 142 mm. Tarawa.

D XI-14; A IV,9; P 14 or 15; lateral line scales 48 to 51. (4 specimens).

Spinous dorsal fin short, longest spine 3.1 in head length; depth of body 2.7 in standard length; third anal spine 1.9 in head length; spine at corner of preopercle 4 in head length; posterior end of maxillary in line with a vertical through center or slightly posterior to center of eye.

Color from 35 mm Kodachrome transparency bright red; alternating longitudinal bands of dark red and light red (nearly white ventrally) on body, the darker red bands running down the center of the scale rows; spinous dorsal fin bright red except tips of membranes and a white spot basally on each membrane; remaining fins red.

Woods *in* Schultz and collaborators (1953) has concluded that *Holocentrum erythraeum* Günther is a synonym of *Holocentrus tiere* Cuvier and Valenciennes.

H. tiere appeared to be the most common member of the genus at Onotoa. It was certainly the most common in coral-rich areas of the outer reef. Some of the Onotoa and the two Tarawa specimens were taken from surge channels.

The stomachs of 15 adult specimens which were collected in the afternoon were opened. All were empty except two which contained well digested remains of small fish. Since holocentrids probably feed mainly at night, the food habits should be investigated from specimens taken at night or early in the morning.

Holocentrus caudimaculatus

Holocentrus caudimaculatus Rüppell 1835. Neue Wirbelth., Fische, pp. 97, 103. (Type locality, Red Sea).

Holocentrum caudimaculatum Günther 1874. Jour. Mus. Godeffroy, vols. 2-3, pts. 5-6, p. 95. (Abemama, Gilbert Islands).

Genus HOLOTRACHYS

Holotrachys Günther 1874. Jour. Mus. Godeffroy, vols. 2-3, pts. 5-6, p. 93. (Type species, *Myripristis lima* Cuvier and Valenciennes).

Holotrachys lima

Myripristis lima Cuvier and Valenciennes 1831. Hist. nat. poiss., vol. 7, p. 493. (Type locality, Mauritius).

1 specimen. 70 mm. Onotoa.

D XII-15; A IV,11; P 17; lateral line scales 42.

No elongate spine at corner of preopercle; third anal spine only slightly longer and stouter than fourth spine.

Color in life bright red.

The one specimen taken was collected from the lagoon side of the west reef of Onotoa.

Genus MYRIPRISTIS

Myripristis Cuvier 1829. Règne animal. ed. 2, p. 150. (Type species, Myripristis jacobus Cuvier and Valenciennes).

Myripristis adustus

Myripristis adustus Bleeker 1853. Nat. Tijdschr. Ned.-Ind., vol. 4, p. 108. (Type locality, Ambon, East Indies).

2 specimens. 185 and 190 mm. 14 specimens. 33 to 63 mm. Onotoa.

1 specimen. 235 mm. Tarawa.

D X-I,15; A IV,13; P 15 or 16; lateral line scales 28; gill rakers 38. (2 specimens).

Color from 35 mm Kodachrome transparency of a 190 mm adult: centers of scales pale, nearly white, rims dark blue dorsally, shading to salmon pink on sides and ventrally; spinous dorsal fin black except for a broad pale lengthwise band down the middle; distal part of soft dorsal, caudal, and anal rays black; basal part of these fins pale pinkish shading to orange red next to black outer part; a blackish spot at postero-medial part of opercle; axil of pectoral fin blackish; iris of eye pale yellow.

The stomachs of four large specimens from Tarawa (not retained for the collection) were opened. Two were empty and two contained one shrimp each.

Myripristis microphthalmus

Myripristis microphthalmus Bleeker 1852. Nat. Tijdschr. Ned.-Ind., vol. 3, p. 261. (Type locality, Ambon, East Indies).

8 specimens. 97 - 148 mm. Onotoa.

D X-I,15 or 16; A IV, 13; P 15; lateral line scales 28; gill rakers 42 or 43 (27 or 28 on lower limb of arch). (3 specimens).

Diameter of eye equal to or less than postorbital part of head (measured to opercular spine); depth of body 2.2 in standard length; head length 3.3 in standard length.

Color from 35 mm Kodachrome transparency: centers of scales light bluish gray (almost white) edges reddish brown (purplish in nape region); posterior edge of opercle broadly margined with reddish brown, this most pronounced at level of eye; brownish red spot in axil of pectoral; spinous dorsal fin light red; soft dorsal, caudal, and anal fins pink basally, shading to red anterodistally in the dorsal and anal and distally in the caudal fins; anal spines white; pectoral fins hyaline red; pelvic fins white.

All of the specimens were obtained in poison station II in the northern part of the atoll.

Myripristis murdjan

Sciaena murdjan Forskål 1775. Descr. animalium, pp. xii, 48. (Type locality, Arabia).

4 specimens. 71 - 155 mm. Onotoa surge channel.

D X-I,14; A IV,11 or 12; P 15; lateral line scales 31 to 33; gill rakers 43 (26 or 27 on lower limb). (2 specimens).

Diameter of eye slightly greater than postorbital part of head; depth of body 2.4 in standard length; length of head 3 in standard length; patch of teeth on anterior part of each side of lower jaw directly below similar but broader patch on each side of upper jaw.

Color of 105 mm specimen from a 35 mm Kodachrome transparency bright red, the centers of the scales white; spinous dorsal fin pink basally, red distally; soft dorsal fin with rays red, membranes yellowish except distal half or more of those between the first five rays which are solid red, shading to brown outwardly; anal fin with similar coloration except anterior spinous portion which is white; caudal fin solid red except upper and lower margins which are white; opercular membrane reddish brown (dusky in preservative); axil of pectoral fin reddish brown; rays of pectoral fin faintly red; pelvic fins with anterior margin white, followed by a narrow red area, the rest whitish; inner two-thirds of iris red, outer one-third white.

Myripristis pralinius

Myripristis pralinius Cuvier and Valenciennes 1829. Hist. nat. poiss., vol. 3, p. 170. (Type locality, Port Praslin, New Ireland).

6 specimens. 51 - 134 mm. Onotoa.

D X-I,15 or 16; A IV,14 or 15; P 15; lateral line scales 37 or 38; gill rakers 36 to 38 (23 or 24 on lower arch). (3 specimens).

Diameter of eye slightly greater than postorbital length of head (measured to end of opercular spine); greatest body depth 2.35 in standard length; head length 3.4 in standard length.

Color from 35 mm Kodachrome transparency rosy red; brown on opercular membrane does not extend below opercular spine; a brown spot at axil of pectoral fin; all fins except pelvics rosy red, the anterior margins of the soft dorsal and anal and margins of caudal lobes narrowly white; rosy red color of soft dorsal and anal fins darkest anterodistally in these fins; pelvic fins whitish; iris red.

The specimens were collected at poison stations II and IV, both regions of numerous small coral heads.

Myripristis multiradiatus

Myripristis multiradiatus Günther 1874. Jour. Mus. Godeffroy, vol. 1, p. 93. (Type locality, Vavau, Tonga Islands).

3 specimens. 103 - 128 mm. Onotoa.

D X-I,16 or 17; A IV, 15; P 14 or 15; lateral line scales 38; gill rakers 38 (24 on lower limb). (2 specimens).

Diameter of eye slightly greater than postorbital length of head (measured to end of opercular spine); body depth 2.35 in standard length; length of head 3 in standard length.

Color in alcohol light yellowish brown; dark brown region from upper edge of gill opening to axil of pectoral fin, this color on edge of opercular bone, on opercular membrane, and exposed part of posttemporal bone; fins color of body except base of caudal fin which is slightly dusky.

The two specimens were collected with rotenone at station IV on the west reef in a maximum of 11 feet of water.

Myripristis argyromus

Myripristis argyromus Jordan and Evermann 1902. Bull. U. S. Fish Comm., vol. 22, p. 172. (Type locality, Hilo, Hawaii).

5 specimens. 105 - 162 mm. Onotoa.

2 specimens. 166 and 168 mm. Tarawa surge channel.

D X-I,14 to 16; A IV,13 or 14; P 14 or 15; lateral line scales 30 to 33; gill rakers 37 to 42 (24 to 26 on lower limb of arch). (5 Onotoa specimens). D X-I,14; A IV,13; P 15; lateral line scales 31; gill rakers 36 and 38 (23 on lower limb). (2 Tarawa specimens).

Diameter of eye equal to or slightly greater than postorbital length of head measured to tip of opercular spine; depth of body 2.4 in standard length; length of head from tip of snout to end of opercular spine 2.8 in standard length; a cluster of 4 or 5 short teeth on a small bony prominence on each side of anterior part of lower jaw medial to a similar but broader patch on each side of upper jaw; patches in lower jaw separated by a distance about twice as great as the diameter of one of the patches.

Color from 35 mm Kodachrome transparency of an Onotoa specimen: light red dorsally, shading to light silvery pink on sides and ventrally; margins of scales bluish brown, darker dorsally than ventrally; brown spot on opercular membrane at level of pupil of eye which extends slightly more above opercular spine than below it; dark brown spot in axil of pectoral fin; spinous dorsal fin pink except distal part which is bright red; soft dorsal and anal fins pink basally, light red distally (red area broader anteriorly in these fins than posteriorly); caudal fin reddish brown, shading to deep red on posterior fourth of fin; paired fins light pink, the pelvics with a white lateral margin; inner half of iris white, outer half dusky.

Color in alcohol of Tarawa specimens: centers of scales light golden, margins light yellowish brown; dark brown pigment on operculum confined to membrane and extending below opercular spine a distance of about 7 mm; axil of pectoral fin dark brown; anterodistal part of soft dorsal and anal fins slightly dusky; iris yellow.

The Onotoa specimens were collected with rotenone from station IV on the west reef of the atoll.

Myripristis sp.

1 specimen. 192 mm. Tarawa.

D X-I,14; A IV,10; P 14 and 15; lateral line scales 32; gill rakers 28-1-16 (total 45).

I am unable to identify this specimen to species. It is very similar to M. argyromus, differing in color only in the reduced pigment on the opercular membrane (the membrane from slightly below the opercular spine to upper edge of gill opening is only faintly dusky). The counts of 10 anal soft rays and 45 gill rakers of this specimen clearly separate it, however, from argyromus, unless it is aberrant in this regard.

The specimen was collected from the same surge channel at Tarawa as the two specimens of argyromus.

Myripristis berndti

Myripristis berndti Jordan and Evermann 1902. Bull. U. S. Fish Comm., vol. 22, p. 170. (Type locality, Honolulu, Hawaii).

3 specimens. 145 - 175 mm. Onotoa.

D X-I,14 or 15; A IV,12 or 13; P 15; lateral line scales 30; gill rakers 38 or 39 (24 or 25 on lower limb of arch). (3 specimens).

Diameter of eye slightly greater than postorbital length of head measured to end of opercular spine (just equal to this length if it is measured to end of opercular membrane); depth of body 2.3 in standard length; length of head 3.05 in standard length; patches of teeth anteriorly on jaws similar to those of M. argyromus; snout length measured from anterior edge of eye to middle of upper lip slightly greater than interorbital width.

Color from 35 mm Kodachrome transparency of a 175 mm specimen: light red, the edges of scales brownish red; centers of some scales, especially those on sides or ventrally, whitish or with two or three small whitish areas; spinous dorsal fin with spines red, membranes rosy red on basal half, orange yellow on outer half; soft dorsal and anal fins bright red with a narrow white anterior margin; caudal fin bright red, upper and lower lobes with a white margin; paired fins red, the pelvics with a lateral white margin; opercular membrane brown almost to level of upper base of pectoral fin (lower third of brown portion of opercular membrane mottled); a brown area in axil of pectoral fin; iris of eye red with marginal white areas.

The specimens were collected at poison station IX on the west reef of Onotoa Atoll.

The stomachs of five specimens discarded in the field (140 to 160 mm in standard length) were opened and found to be empty.

Family MUGILIDAE

The mullets, like the goatfishes, were most commonly seen in shallow, sandy areas of the lagoon at Onotoa. On two occasions small schools of a large species believed to be Mugil cephalus were sighted in surge channels of the outer reef. The usually common Neomyxus chaptili was not seen, nor is it recorded from the Gilbert Islands, but it probably occurs there.

The species which I designate below as Mugil seheli, M. engeli, and M. vaigiensis are considered as belonging to the genus Chelon Röse by Schultz in Schultz and collaborators (1953), although he admits Chelon is a "catch-all" genus in need of further refinement. The characters used by Schultz to separate Chelon from Mugil involve the position of the nostrils and the nature of the adipose eyelid. He points out, however, (p. 312) that the adipose eyelid in Chelon loses much of its significance because the amount of its development varies. I experienced difficulty with the characters involving the position of the nostrils, and therefore prefer to leave these three species, at least, in Mugil. I am in agreement with Schultz in not recognizing Ellochelon Whitley (with Mugil vaigiensis as its type species) and Valamugil Smith (with Mugil seheli as its type species).

Genus MUGIL

Mugil Linnaeus 1758. Syst. nat., ed. 10, p. 316. (Type species, Mugil cephalus Linnaeus).

Mugil seheli

Mugil crenilabis var. seheli Forskål 1775. Descr. animalium, pp. xiv, 73. (Type locality, Red Sea).

1 specimen. 310 mm. Tarawa.

D IV-I,8; A III,9; P 18; scale rows from upper end of gill opening to base of caudal fin 39.

Color in alcohol dusky brown dorsally shading to light brown on sides and ventrally; an indistinct blackish spot at upper edge of base of pectoral fin.

No adipose eyelid; lips smooth; ventro-anterior margin of preorbital straight and finely serrate; maximum body depth contained 3.7 times in standard length; caudal fin, though damaged, appears to be lunate; second dorsal and anal fins scaly; pectoral slightly shorter than length of head, axillary scale at level of upper margin of pectoral nearly half the length of the pectoral.

Mugil engeli

Mugil engeli Bleeker 1858. Nat. Tijdschr. Ned.-Ind., vol. 15, p. 385. (Type locality, Batavia, Java).

3 specimens. 110 - 123 mm. Onotoa.

1 specimen. 111 mm. Tarawa.

D IV-I,8 or 9; A III,8 or 9; P 16; scale rows from upper end of gill opening to base of caudal fin 32 or 33. (4 specimens).

Color in alcohol: dorsal half of body dusky brown (consisting of a dense stippling of tiny brown dots); lower half of body tan; operculum and chest largely silvery; fins pale with fine speckles of dark brown.

Adipose eyelid only slightly developed; lips smooth; depth of body contained about 4 times in standard length; ventro-anterior margin of preorbital with an angular concavity; length of pectoral fin about equal to length of head; caudal fin slightly forked.

One of the specimens was obtained from a Gilbertese fisherman who had several for use as bait while trolling for tuna. The hook was completely imbedded in the mullet for this purpose.

Mugil vaigiensis

Mugil vaigiensis Quoy and Gaimard 1824. Voyage autour du monde... "Uranie"...Zool., p. 337, pl. 59, fig. 2. (Type locality, Waigeo Island, New Guinea).

Ellochelon vaigiensis Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 289. (Nauru).

2 specimens. 93 and 205 mm. Onotoa lagoon.

2 specimens. 92 and 93 mm. Tarawa.

D IV-I, 7 or 8; A III,8; P 16; scale rows from upper end of gill opening to base of caudal fin 25 or 26. (2 specimens).

Color in life of large specimen silvery white; scales on back with blackish edges; upper half to two-thirds of pectoral fin black, lower half pale; other fins dusky bluish except pelvics which are white. The 93 mm specimen had a yellowish caudal fin in life.

Mugil tade

Mugil crenilabis var. *tade* Forskål 1775. Descr. animalium, pp. xiv, 74. (Type locality, Red Sea).

Mugil tade Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 122, fig. 26. (Abaiang, Kingsmill Islands).

Genus CRENIMUGIL

Crenimugil Schultz 1946. Proc. U. S. Nat. Mus., vol. 96, p. 387. (Type species, *Mugil crenilabis* Forskål).

Crenimugil crenilabis

Mugil crenilabus Forskål 1775. Descr. animalium, pp. xiv, 73. (Type locality, Red Sea).

1 specimen. 108 mm. Onotoa lagoon.

D IV-I,8; A III,9; P 17; scale rows from upper end of gill opening to base of caudal fin 39.

Color in alcohol dark brownish dorsally shading to tan on sides and ventrally; a black spot at upper edge of base of pectoral fin.

Margin of lower lip strongly crenulate; inside of margin a row of ridge-like, irregular papillae; upper lip with about 4 rows of small papillae on outer edge.

Family ATHERINIDAE

Genus ALLANETTA

Allanetta Whitley 1943. Proc. Linn. Soc. N. S. Wales, vol. 68, p. 135. (Type species, Atherina mugiloides McCulloch).

Allanetta ovalaua

Atherina ovalaua Herre 1935. Publ. Field Mus. Nat. Hist., zool. ser., vol. 18, p. 401. (Type locality, Fiji Islands).

3 specimens. 27 - 61 mm. Onotoa lagoon.

3 specimens. 24 - 43 mm. Abemama.

D VI or VII-I,9 or 10; A I, 9 or 10; P 17. (4 specimens). Transverse scale rows from gill opening to base of caudal fin 43. (1 specimen).

Color of 61 mm specimen in alcohol light brown with a dusky bluish line about equal to diameter of pupil in width running from upper axil of pectoral fin to base of caudal fin; scales on dorsal part of body edged in black; end of snout and lower jaw with a concentration of black pigment; a narrow black dotted line at base of pectoral fin; a tiny black spot anterior to upper base of pectoral fin; all fins hyaline except a bilobed area in mid-base of caudal fin which is dusky.

Rami of mandibles distinctly elevated at rear of toothed area; anus between pelvic fins; depth of body 6.5 in standard length.

Family SPHYRAENIDAE

Genus SPHYRAENA

Sphyraena Walbaum 1792. Petri Artedi sueci genera piscium, pp. 94, 584. (Type species, Esox sphyraena Linnaeus).

Sphyraena forsteri

Sphyraena forsteri Cuvier and Valenciennes 1829. Hist. nat. poiss., vol. 3, p. 353. (Type locality, Tahiti).

1 specimen. 820 mm. Onotoa. (Only head and caudal fin preserved).

D V-I,9; A II,8; P 14; lateral line scales 116.

Angle of preoperculum rounded; maxillary reaches a vertical through anterior edge of eye; no elongate gill raker at angle of first gill arch; numerous tiny bony spinules on gill arch from angle over half way to ventral origin of arch; eye 7.7 in length of head from tip of upper jaw to end of operculum; eye 3.3 in postorbital part of head; no rasp-like teeth visible on tongue; an elongate canine tooth in upper jaw about an eye diameter distance from tip of upper jaw, this tooth flanked with one anteriorly and one posteriorly about one-third to one-half as long; a gap slightly less than an eye diameter in distance separates the long anterior canine tooth from a series of four of comparable length posteriorly in the jaw which, in turn, are followed by teeth of gradually smaller length; teeth in posterior part of lower jaw short, shark-like, the anterior edge of each somewhat longer than the posterior edge; edge of opercle with two flexible flattened spines, the lowermost more projected than the upper; posterior margin of caudal fin deeply concave with two prominent bumps in mid-portion.

This specimen differs from forsteri as described by Weber and de Beaufort (1922: 223) in lacking rasplike teeth on the tongue, and having a smaller eye, and a bi-lobed shape to the postero-central margin of the caudal fin. The eye is smaller than specimens of this species reported by Schultz (1953: 284) from the Marshall Islands. Since my specimen is larger than any seen by Weber and de Beaufort and by Schultz, it is possible that the differences in size of eye and shape of caudal fin are a function of age.

The specimen was caught by a Gilbertese fisherman by trolling.

Family SERRANIDAE

This family, as based on Gilbert Islands collections, includes the groupers, anthiids, and the genus Ypsigramma. The groupers were numerous at Onotoa. The young of some species were very abundant in tidepools and were caught by the Gilbertese and dried in the sun for food. Adult groupers were not so commonly seen because of their procilivity for hiding in holes and caverns in the reef, but now and then one could be observed purposefully swimming from one part of the reef to another.

Genus EPINEPHELUS

Epinephelus Bloch 1793. Natur. ausländ. Fische, vol. 7, p. ii. (Type species, *Epinephelus marginatus* Bloch = *Perca fasciatus* Forskål)

Epinephelus fuscoguttatus

Perca summana var. *fusco-guttata* Forskal 1775. Descr. animalium, pp. 11, 42. (Type locality, Red Sea).

Serranus fuscoguttatus Rüppell 1828. Atlas Reise nörd. Afrika, Fische des rothen Meers, p. 108, pl. 27, fig. 2.

Epinephelus fuscoguttatus Schultz 1943 (in part). Bull. U. S. Nat. Mus. 180, p. 108.

1 specimen. 288 mm. Onotoa.

D XI,15; A III,8; P 17; gill rakers 25.

Color in alcohol brown with large irregular dark brown blotches on head and body (most prominent dorsally) and everywhere covered with numerous, small, close-set dark brown spots; a prominent black saddle dorsally on caudal peduncle.

Another grouper, *Epinephelus horridus* (Cuvier and Valenciennes), has a very similar color pattern to *fuscoguttatus*, and the two have long been confused. It is difficult to decide from Forskal's brief description of *fuscoguttatus* which species should bear his name. I have chosen the more slender form as figured by Rüppell (1828) from the Red Sea. I am influenced further by seeing three specimens of this species from the Red Sea among the collections in the United States National Museum and failing to find any (nor any definite reference from the literature) of the deeper bodied form which I am designating *horridus* from this locality. Forskål's description of the spots as reddish brown supports my decision, for there are several preserved specimens from the Marshall Islands in the museum on which the spots are still slightly reddish. A Kodachrome transparency of *horridus* from life shows the spots as definitely not reddish. In view of the well known ability for the groupers to attain varied hues, this bit of evidence must be taken lightly, however.

Counts were made from one of the Red Sea specimens and one of the Marshall Islands specimens. The counts were the same as those of the Gilbert Islands specimen except for the dorsal soft rays and pectoral rays of the one from the Red Sea which were 14 and 18, respectively. For further discussion of *fuscoguttatus*, see *horridus* below.

Epinephelus horridus

Serranus horridus Cuvier and Valenciennes 1828. Hist. nat. poiss., vol. 2, p. 321. (Type locality, Java).

Serranus fuscoguttatus Day 1876. Fishes of India, p. 22, pl. 5, fig. 3.

Epinephelus fuscoguttatus Schultz 1943 (in part). Bull. U. S. Nat. Mus. 180, p. 108.

1 specimen. 304 mm. Onotoa.

D XI,14; A III,8; P 19; gill rakers 36.

Color from 35 mm Kodachrome transparency light yellowish brown with large irregular dark brown patches on head and body (darkest dorsally) and numerous, close-set, small brown spots on head, body, and fins; a very dark brown saddle dorsally on caudal peduncle.

E. horridus may be told at a glance from *fuscoguttatus* by body depth and by the profile of the head. The latter is a more slender species and has a slightly and smoothly convex forehead; in *horridus* there is a distinct indentation at the eye where the convexity of the snout meets a marked convexity of the nape. Gill raker and pectoral fin ray counts provide conclusive meristic separation. Gill raker counts included all rudiments. A specimen of *horridus* from Canton Island, Phoenix Group, identified as *fuscoguttatus* by Schultz (1943), gave the same meristic data as the Onotoa specimen.

Epinephelus corallicola

Epinephelus corallicola Cuvier and Valenciennes 1828. Hist. nat. poiss., vol. 2, p. 336.

Epinephelus macrospilus Bleeker 1873-76. Atlas ichth., vol. 7, pp. 33, 52, pl. 290, fig. 2.

Epinephelus altivelioides Bleeker ibid, pl. 308, fig. 1

Epinephelus macrospilus Schultz *in* Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, vol. 1, pp. 330, 344, pl. 25, B.

Epinephelus spilotus Schultz *in* Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, vol. 1, pp. 332, 352, fig. 55.

5 specimens. 72 - 310 mm. Onotoa lagoon and lee reefs

2 specimens. 98 and 160 mm. Nukunau.

D XI (one with XII), 16 or 17; A III,8; P 17 to 19; gill rakers 24 or 25. (3 specimens).

Color from 35 mm Kodachrome transparency of 120 mm specimen: body dull white with widely scattered blackish orange spots (slightly smaller than pupil of eye in average size); caudal fin yellowish white with scattered black spots, a concentration of these forming a submarginal band; margin of caudal fin light yellow; dorsal fin dull white with scattered black spots and pale margin; anal fin similar to dorsal but duskier; paired fins blackish, the pectorals with narrow light yellow margin and the pelvics with narrow white margin; iris yellow; pupil bluish. The 72 mm specimen has fewer spots (a total of 23 appearing on head and body, the most prominent being the 5 at the base of the dorsal fin and one dorsally on caudal peduncle. In the 310 mm specimen (which differed from the rest in having XII dorsal spines and 17 pectoral rays), the spots are relatively more numerous and smaller than the 120 mm specimen, but still well-spaced. There is a slight concentration of spotting at the base of the last few spines of the dorsal fin and dorsally on caudal peduncle to form a small black saddle.

A 126 mm specimen included among the five above is dark brown with black spots instead of light brown with black spots.

Gill rakers of 5 specimens from the Marshall Islands (paratypes of spilotus) numbered 25.

The stomach contents of a 275 mm specimen were examined. The specimen had eaten a scyllarid lobster. The stomach of a 150 mm specimen was empty.

Epinephelus sp.

1 specimen. 215 mm. Onotoa lagoon.

D XI,17; A III,8; P 17; gill rakers 25.

I am unable to identify this species. In color it is more-or-less intermediate to fuscoguttatus and corallicola. The body is brown with irregular darker brown areas and faint spots; there are 4 darker areas along the base of the anal fin, but these can be perceived only with difficulty. The head is densely spotted with small brown dots like fuscoguttatus; the fins are brownish with dark brown to black spots (larger and more evident than those on body) and pale margins. The edge of the hollow area in the cheek into which the maxillary fits when the mouth is closed is blackish.

The scales are more evident on the body than the previous epinephelids, and 100 were counted from upper edge of gill opening to base of caudal fin. Caudal fin rounded; longest dorsal soft ray about equal in length to longest dorsal spine;

head 2.7 in standard length; pectoral fin 1.7 in head; greatest diameter of eye 5.5 in head; depth of body 2.9 in standard length.

There is no definite black saddle on the caudal peduncle; there are no white spots on the body or fins.

Epinephelus socialis

Serranus socialis Günther 1873. Jour. Mus. Godeffroy, vol. 2, pt. 3, p. 7, pl. 8, fig. B. (Kingsmill Islands).

Epinephelus merra

Epinephelus merra Bloch 1793. Natur. ausländ. Fische, vol. 7, pt. 10, p. 17, pl. 329. (Type locality, Sea of Japan).

10 specimens. 40 - 132 mm. Onotoa.

D XI,16; A III,8; P 17 or 18; gill rakers 22 to 24. (3 specimens).

Color from 35 mm Kodachrome transparency of a 145 mm specimen (discarded in field): white with numerous close-set roundish brown spots on head, body, and fins (those on body mostly larger than size of pupil but smaller than size of eye); spots on pectoral fin smaller and darker than spots elsewhere on body or other fins; ground color of pectoral fin light yellowish; spots distally on caudal and soft portions of dorsal and anal fins smaller and darker; no large black spot or spots at base of dorsal fin or dorsally on caudal peduncle.

Depth of body 3 to 3.2 in standard length; length of pectoral fin 1.5 in head length.

This was apparently the most common species of Epinephelus at Onotoa. It was confused in the field with E. hexagonatus, and many specimens of both species were discarded. It is now impossible to decide on the exact localities at Onotoa where the two were collected. It is definite, however, that the young of merra were abundant in the outer reef tidepools.

The two species may be separated by gill raker counts (see table under hexagonatus below).

Both E. merra and E. hexagonatus appear to be small species, rarely exceeding 200 mm in standard length.

Epinephelus hexagonatus

Holocentrus hexagonatus Bloch and Schneider 1801. Systema ichth., p. 323. (Type locality, Tahiti).

Epinephelus melanostigma Schultz in Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, vol. 1, pp. 331, 348, fig. 54. (Type locality, Swains Islands, Samoa Group).

Epinephelus spilotoceps Schultz in Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, vol. 1, pp. 332, 357, figs. 56, 57. (Type locality, Bikini Atoll, Marshall Islands).

7 specimens. 25 - 91 mm. Onotoa.

2 specimens. 42 and 102 mm. Tarawa.

1 specimen. 148 mm. Nukunau.

D XI, 15 or 16; A III,8; P 18, (2 specimens).

Color in alcohol light brown with numerous close-set roundish to hexagonal dark brown spots on body (in average diameter about one half eye diameter); 4 to 5 very dark brown to black blotches along base of dorsal fin and another dorsally on caudal peduncle; spots in fins generally not dark and often with pale centers; outer half of pectoral fin unspotted or very faintly spotted.

I examined type material of Epinephelus spilotoceps Schultz and E. melanostigma Schultz, and I am convinced that these are the same as hexagonatus. Schultz separated spilotoceps from hexagonatus primarily on the presence of small black spots on the front part of the head of the former and white triangular spots at the angles between brown spots on the body of the latter. I found examples from the Marshall Islands collections which were intermediate between these two color patterns. One showed very distinctly both the small white spots between the large hexagonal brown spots on the body and the tiny black spots anteriorly on the head. Gill raker counts were made on the type and paratypes of spilotoceps and are given in the table below where they can be compared with the counts of hexagonatus. Intermediate specimens were not counted.

Schultz separated melanostigma from other similar groupers primarily by its lacking a black dorsal saddle on the caudal peduncle and in having only one large black spot at the base of the dorsal fin. Actually most of the type material shows a darkening of spots dorsally on the caudal peduncle and the four or five dark blotches along the dorsal base as in hexagonatus, although the large spot at the rear base of the spinous portion of the dorsal fin is relatively more prominent in melanostigma than hexagonatus. In the table of gill raker counts it will be observed that melanostigma has more gill rakers. In most of the specimens this higher count was due to the addition of two tiny rudiments, on the average, at the extreme upper end of the arch. The type and all of the paratypes of melanostigma are from the Phoenix and Samoa

Islands; Schultz records no specimens of *hexagonatus* from these island groups. His *spilotoceps* and *hexagonatus* are from the Marshall and Marianas Islands. Until *melanostigma* and *hexagonatus* can clearly be shown to occur in the same area, I prefer to consider the slight differences which separate these two forms as subspecific.

Table 2 Gill Raker Counts of Species of *Epinephelus* of the "*merra*" Complex

	Number of rakers (including rudiments) on the first arch								
	21	22	23	24	25	26	27	28	29
merra									
Marshall and Gilbert Islands	1	3	5	2					
hexagonatus									
Marshall and Gilbert Islands			1	2	2	4	2		
spilotoceps									
Marshall Islands			1	1	5	4	1		
melanostigma									
Phoenix and Samoa Islands					1	3	3	3	

Epinephelus flavocaeruleus

Holocentrus flavo-caeruleus Lacépède 1802. Hist. nat. poiss., vol. 4, pp. 331, 367. (Type locality, Mauritius).

Epinephelus Hoedti Bleeker 1873-76. Atlas ichth., vol. 7, pp. 32, 45, pl. 283, fig. 2.

Serranus flavo-caeruleus Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 177. (Gilbert Islands).

10 specimens. 50 - 104 mm. Onotoa.

1 specimen. 310 mm. Tarawa.

D XI,16 or 17; A III,8; P 19 or 20; gill rakers 26. (2 specimens).

Color from 35 mm Kodachrome transparency of 104 mm specimen purplish blue, shading to yellow on caudal peduncle; blue part of body and head with numerous small black spots; spinous dorsal fin blue with small black spots except margin which is broadly yellow; soft part of dorsal fin yellow except antero-basal portion which is blue with small black spots; anal fin yellow; caudal fin yellow with whitish posterior margin; pectoral fins hyaline yellow; pelvic fins yellow, the tips blackish.

Caudal truncate; depth of body 2.4 in standard length; middle of three opercular spines nearest the lowest spine.

This colorful grouper was common in shallow sandy areas of the lagoon with scattered, well-isolated coral heads. It was seen in no other habitat.

Epinephelus caeruleopunctatus

Holocentrus caeruleo-punctatus Bloch 1790. Natur. ausländ. Fische, vol. 4, p. 94, pl. 241, fig. 2.

1 specimen. 44 mm. Tarawa.

D XI,16, A III,8, P 18; gill rakers 15.

Color in alcohol dark brown with scattered small white spots of different size on head and body (38 spots in all on one side); fins all dark brown with small white spots and white margins.

Genus CEPHALOPHOLIS

Cephalopholis Bloch and Schneider 1801. Systema ichth., p. 311. (Type species, Cephalopholis argus Bloch and Schneider).

Cephalopholis argus

Cephalopholis argus Bloch and Schneider 1801. Systema ichth., p. 311, pl. 61. (Type locality, East Indies).

12 specimens. 38 - 209 mm. Onotoa.

1 specimen. 140 mm. Tarawa.

D IX,16; A III,9; P 18; gill rakers 27 and 28 (includes many rudiments). (2 specimens).

Color from 35 mm Kodachrome transparency dark purplish brown with numerous dark-edged bright blue spots on head and body; five vertical pale bands on posterior half of body (not seen in all specimens); basal part of spinous portion of dorsal fin colored like body, ends of membranes orange; remaining fins dark blue with blue spots somewhat obscured; posterior margin of caudal fin whitish.

This was a common species at Onotoa and was seen in many different habitats.

The stomachs of 10 specimens, 95 to 260 mm in standard length, were opened. One contained 3 small fish (very fresh and probably prior victims of the rotenone). Another contained a penaeid shrimp; the rest were empty.

Cephalopholis sonnerati

Serranus sonnerati Cuvier and Valenciennes 1828. Hist. nat. poiss., vol. 2, p. 299. (Type locality, Pondicherry and Ceylon).

1 specimen. 61 mm. Onotoa lagoon.

1 specimen. 223 mm. Tarawa.

D IX,15; A III,9; P 18 or 19; gill rakers 22 and 23. (2 specimens).

Color in life of 61 mm specimen light yellowish brown with 5 or 6 faint dark vertical bars on upper half of body; small brown spots covering head and body (orangish brown on head); faint white spots posteriorly and ventrally on body; dorsal and anal fins brown with whitish margins on soft portions; caudal fin brown with a broad whitish posterior border (broader at ends of upper and lower rays than median rays), the extreme margin reddish; pectoral fin dusky in basal central portion, whitish on outer half; pelvic fins dark brown. The 223 mm specimen is uniform brown in alcohol.

Middle opercular spine nearest lower spine; caudal fin rounded; palatine and vomerine teeth present; 127 vertical scale rows from upper anterior end of gill opening to middle base of caudal fin; depth 2.5 in standard length.

Cephalopholis hemistiktos

Serranus hemistiktos Rüppell 1828. Atlas Reise nörd. Afrika, Fische, rothen Meers, p. 109, pl. 27, fig. 3. (Type locality, Red Sea).

Epinephelus hemistictus Boulenger 1895. Cat. fishes British Mus., p. 190.

1 specimen. 84 mm. Onotoa lagoon.

D IX,14; A III,9; P 18; gill rakers 22.

Color in alcohol very dark brown with small blackish spots on head, body, and median fins (more prominent on head, but difficult to see even here because of dark ground color of the specimen); caudal fin with a distinct white posterior margin (broader at upper and lower part); soft portions of dorsal and anal fins with a very narrow whitish margin; pectoral fin blackish, shading to dusky pale on about outer one-third of rays.

To my knowledge this species has never been recorded from the Pacific. Boulenger (1895:191) lists it from the Red Sea, south coast of Arabia, and Zanzibar. I have compared my specimen with a 138 mm one from the Red Sea. The counts of the latter are D IX,14; A III,9; P 17; gill rakers 21. The Gilbert Islands specimen is more melanistic; there is a large black spot posteriorly on the opercle; the pale band posteriorly on the caudal is broader; the pale outer part of the pectoral is less obvious. The dentition is very similar in both. There is a pair of canines anteriorly in the upper jaw separated by about 3/4 of an eye diameter and a pair anteriorly in the lower jaw separated by about half an eye diameter; the bands of palatine and vomerine teeth are narrow. The snout is slightly shorter in the Gilbert Islands specimen, its length contained 4.7 in the head length; that of the Red Sea specimen is about 4.2 in the head length.

I identify my specimen as hemistiktos with some uncertainty. I believe that the differences noted might be due to the difference in size of the two specimens which were compared and to their great spatial separation. When specimens of Indo-Pacific species of fishes from the Red Sea are compared with ones from Oceania slight differences are often apparent.

Cephalopholis urodelus

Percam urodetam (Forster) Bloch and Schneider 1801. Systema ichth., p. 333. (Type locality, St. Christina, Waitaho).

Serranus urodelus Günther 1873. Jour. Mus. Godeffroy, vol. 2, pt. 3, p. 3, pl. 3, fig. A. (Kingsmill Islands).

Cephalopholis urodelus Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 175. (Gilbert Islands).

8 specimens. 34 - 69 mm. Onotoa.

D IX,15 or 16; A III,9; P 17 or 18; gill rakers 23. (2 specimens).

Color in alcohol dark brown; a prominent black spot posteriorly on opercle; caudal fin blackish with a broad angular region of the upper and lower corners pale with dusky (bright red in life) center; dorsal and anal fins blackish, the soft portions of each with a narrow dusky margin and a broad pale submarginal band; centro-basal part of pectoral fin blackish, outer part pale; pelvic fins pale with dusky margins.

Schultz (1943) confused C. leopardus with urodelus. The specimens from the Phoenix and Samoa Islands which he identified as leopardus were actually urodelus and vice versa. He corrected this error in U. S. Nat. Mus. Bull. 202 (1953: 366).

Cephalopholis leopardus

Labrus leopardus Lacépède 1802. Hist. nat. poiss., vol. 3, pp. 450, 518, pl. 30, fig. 1. (Type locality, "le grande Océan équatorial").

Cephalopholis urodelus Schultz 1943. Bull. U. S. Nat. Mus. 180, p. 109.

33 specimens. 27 - 95 mm. Onotoa.

D IX,14; A III,9; P 17; gill rakers 23 or 24. (2 specimens).

Color from 35 mm Kodachrome transparency of 95 mm specimen: body light grayish pink with 5 indistinct pink vertical bars which contain light grayish pink spots; an elongate black spot (in some specimens 2 spots) mid-dorsally on caudal peduncle; head light purplish gray with numerous faint pinkish spots and a dusky band from eye to upper posterior edge of operculum; dorsal fin color of body except for broad light red margin; anal fin light red; caudal fin light red with a diagonal black band on upper hind corner; pectoral fin orange with a narrow faint reddish margin.

This species was abundant in coral areas of the lagoon and the outer reef.

The stomachs of 6 specimens 80 to 109 mm in standard length were opened. One contained a small fish, and the rest were empty.

Genus ANYPERODON

Anyperodon Günther 1859. Cat. fishes British Mus., vol. 1, p. 95. (Type species, *Serranus leucogrammicus* Cuvier and Valenciennes).

Anyperodon leucogrammicus

Serranus lencogrammicus Cuvier and Valenciennes 1828. Hist. nat. poiss., vol. 2, p. 347. (Type locality, Moluccas and Seychelles).

2 specimens. 160 and 169 mm. Onotoa lagoon.

D XI,15; A III,9; P 16; gill rakers 29. (1 specimen).

Color in life olive green with rust-colored spots on head and body.

Body slender, depth about 3.7 in standard length; no palatine teeth; caudal rounded.

Genus PLECTROPOMUS

Plectropomus Oken 1782. Isis, p. 1782. (Type species, *Bodianus maculatus* Bloch).

Plectropomus truncatus

Plectropomus truncatus Fowler and Bean 1930. Bull. U. S. Nat. Mus. 100, vol. 10, p. 196, fig. 5. (Type locality, Atulayan Island, Luzon).

2 specimens. 290 and 368 mm. 1 specimen. 32 mm. Onotoa.

D VIII,11; A III,8; P 15 or 16. (2 specimens). gill rakers 11 (all but 3 are rudiments). (1 specimen).

Color from 35 mm Kodachrome transparency of 368 mm specimen dark brown with head, body, and fins covered with numerous small dark-edged metallic blue-green spots.

Caudal fin truncate; depth of body about 3.2 in standard length; a pair of close-set canine teeth anteriorly on each side of upper jaw, each pair separated by about an eye diameter in distance; lower jaw with similar anterior dentition, the pairs being slightly closer together, and two additional well-spaced canines posteriorly. The ends of these long canines fit into sockets on the opposite jaw.

The small specimen was taken with rotenone from the surface of a lagoon coral head in three feet of water. It was brown with dark blue spots. One of the adults was collected from the lagoon side of the west reef in about 5 feet of water and the other from the leeward outer reef in the northern part of the atoll at about the same depth.

Genus VARIOLA

Variola Swainson 1839. Nat. hist. class. fishes, amphibians, ..., vol. 2, p. 202. (Type species, *Variola longipinna* Swainson).

Variola louti

Perca louti Forskål 1775. Descr. animalium, pp. xi, 40. (Type locality, Red Sea).

2 specimens. 182 and 225 mm. Tarawa.

D IX,14; A III,8; P 19; gill rakers 24 (counting all rudiments) (1 specimen).

Color from 35 mm Kodachrome transparency of a specimen collected at Kwajalein, Marshall Islands: greenish brown, shading to purplish on chin and abdomen, with numerous dark-edged red spots on head, body, and fins (those on body horizontally elongate); pectoral fin yellow, blackish basally; margin of caudal fin orangish.

A pair of elongate canine teeth anteriorly in upper and lower jaws, those on lower jaw more medially located than those on upper jaw; two elongate canines in middle of side of dentary; canine teeth fitting into sockets in the opposite jaw; caudal fin very lunate.

Genus GRAMMISTES

Grammistes Bloch and Schneider 1801. Systema ichth., p. 182. (Type species, Grammistes orientalis Bloch and Schneider = Perca sex-lineata Thünberg.)

Grammistes sexlineatus

Perca sexlineata Thünberg 1792. Kongl. Vet. Akad. Nya Handl., vol. 13, p. 142, pl. 5. (Type locality, East Indies).

Grammistes orientalis Günther 1873. Jour. Mus. Godeffroy, vol. 2, pt. 3, p. 10. (Kingsmill Islands).

Genus YPSIGRAMMA

Ypsigramma Schultz in Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, p. 372. (Type species, Ypsigramma lineata Schultz = Chorististium susumi Jordan and Seale).

Ypsigramma brocki

Ypsigramma brocki Schultz in Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, pp. 373, 379, fig. 60. (Type locality, Rongelap Atoll, Marshall Islands).

1 specimen. 58 mm. Onotoa.

D VI-I,12; A III,8; P 14; gill rakers 6-1-13.

Color in life light gray with irregular olive-brown longitudinal lines on the body, three of which carry forward to hind edge of eye; fins pink; snout reddish; iris yellow.

This specimen was designated by Schultz (1953) as a paratype of brocki.

I examined the holotype of Y. susumi (Jordan and Seale 1906:256, fig. 48). The chief basis for Schultz' consideration of *Y. lineata* as distinct from *susumi* is the possession by the latter of 10 predorsal scales instead of 12. I counted 12 on *susumi*. In view of this and the great similarity in color pattern, I place *lineata* in the synonymy of *susumi*.

Y. brocki is obviously very closely related to *susumi* from which it differs slightly in color pattern. The holotype of *brocki* is 40 mm long. It has only traces of lengthwise lines on the body. The Onotoa paratype, 58 mm in length, is intermediate in color between the holotype of *brocki* and the holotype of *susumi*, which measures 66 mm. Probably *brocki* should also be a synonym of *susumi*. More specimens are needed to elucidate this problem.

Genus ANTHIAS

Anthias Bloch 1792. Natur. ausländ. Fische, vol. 6, pt. 9, p. 97. (Type species, *Labrus anthias* Linnaeus).

Anthias squamipinnis

Serranus (*Anthias*) *squamipinnis* Peters 1855. Monatsb. Akad. Wiss. Berlin, p. 429. (Type locality, Mozambique).

? *Anthias nobilis* Franz 1910. Abh. Bayer. Akad. Wiss., vol. 4, p. 38, pl. 4, fig. 44.

1 specimen. 64 mm. Onotoa lagoon.

D X,17; A III,7; P 18; gill rakers 9-1-24.

Color in life brown with an orange band from eye to pectoral fin (faint in preservative); snout and tip of lower jaw orange; rows of longitudinal orange spots on side of body (no longer visible in preservative); a bright red spot on upper distal part of pectoral fin between third and seventh rays (this spot blackish in preservative); caudal fin bright yellow, the upper and lower lobes orange; dorsal fin brown basally, orange distally; anal fin yellowish.

There are 45 to 50 lateral line scales. The specimen was speared and badly damaged in the middle of the body on both sides, hence an accurate count of lateral line scales can not be made; 5 scales between anterior end of lateral line and origin of dorsal fin; two opercular spines; entire head scaled; maxillary scaled; caudal fin deeply forked, the lobes drawn out in filaments; distance from tip of upper lobe to most anterior part of posterior margin of caudal fin contained 4.7 times in standard length; depth of body 3.1 in standard length; eye 3.7 in head length; head 3.6 in standard length; a canine tooth extending antero-laterally from each corner of tip of lower jaw; a second canine tooth, slightly larger, a short distance behind the first and recurved posteriorly; dorsal fin continuous; third dorsal spine not produced to a filament.

According to Fowler and Bean (1939:305) the third dorsal spine of this species is not always elongate.

I examined a specimen from the Philippines identified as squamipinnis by Fowler and Bean. It differed from the one from Onotoa in having the third dorsal spine produced, a less evident blackish spot on the pectoral fin, 40 lateral line scales, and a gill raker count of 10-1-22.

Fowler and Bean considered Anthias nobilis Franz from Japan as a variety of squamipinnis. At least in coloration, the Onotoa specimen more nearly resembles this form.

Genus MIROLABRICHTHYS

Mirolabrichthys Herre 1927. Philippine Jour. Sci., vol. 32, p. 413. (Type species, Mirolabrichthys tuka Herre and Montalban).

Mirolabrichthys tuka

Mirolabrichthys tuka Herre and Montalban 1927. Philippine Jour. Sci., vol. 32, p. 413, pl. 1. (Type locality, Maricaban Island, Philippine Islands).

1 specimen. 85 mm. Onotoa.

D X,16; A III,7; P 18; gill rakers 34.

Color in life rosy lavender shading to light lavender ventrally; an orange line from snout to base of pectoral fin; faint longitudinal lines of orange dots on body; fins bright magenta.

A small fleshy prominence extending ventrally from tip of upper jaw; maxillary broad, maximum depth more than one-half eye diameter; a canine tooth projecting antero-laterally from each side of end of lower jaw; a second canine tooth, its tip curved backward, on each side of mandible posterior to first canine; margin of hind half of orbit papillate; caudal fin deeply forked, the lobes produced to filaments; depth of body about 3 in standard length; eye 4.5 in head length; dorsal fin continuous.

Herre and Montalban described the life color of tuka from the Philippines as brownish red above, the sides roseate, with two longitudinal golden red bands, and golden fins with a violet patch on the soft dorsal. I examined specimens in the United States National Museum from the Philippines and East Indies identified as tuka and found no important differences in the color in preservative or morphology between these and the Onotoa specimen. The counts from a specimen from Borneo are: D X,15; A III,7; P 17; gill rakers 33. I believe that the apparent differences in life color and possible differences in counts are only subspecific, indicative of slight differentiation of the populations in the Philippine-East Indies area and the Gilbert Islands.

At Onotoa this beautiful species was sighted in small schools hovering above the bottom on the outer coralliferous terrace in about 30 feet of water. The gill rakers are very long, suggesting that it might be a plankton feeder. The same is true of *Anthias squamipinnis*.

One additional specimen was taken at Onotoa from the stomach of an adult *Caranx melampygus*. It was about half digested and was discarded.

The genus *Mirolabrichthys* may eventually be placed in the synonymy of *Anthias* when the Anthiinae is carefully revised, as indeed it should be.

Family PSEUDOCHROMIDAE

I am following Schultz (1953: 388) in placing *Pseudochromis*, *Pseudogramma*, *Pseudoplesiops*, and *Plesiops* in the one family Pseudochromidae. Although this may be ultimately shown to be an unnatural grouping of these little fishes, it appears to be a suitable classification at the present time.

Genus PSEUDOCHROMIS

Pseudochromis Rüppell 1835. Neue Wirbelth....Fische. p. 8. (Type species, *Pseudochromis olivaceus* Rüppell).

Pseudochromis tapeinosoma

Pseudochromis tapeinosoma Bleeker 1853. Nat. Tijdschr. Ned.-Ind., vol. 4, p. 115. (Type locality, Ambon, East Indies).

4 specimens. 36 - 39 mm. Onotoa.

3 specimens. 38 - 43 mm. Tarawa.

D III,22; A III,13; V I,5; P 18; dorsal lateral line scales plus scale rows to base of caudal fin 36 and 37. (2 specimens).

Color in alcohol brown; fin rays of dorsal and anal fins dark brown, membranes dusky; basal half of caudal fin (scaled) dark brown, outer half and dorsal and ventral margins dusky; paired fins dusky. In life the posterior part of the body was yellowish.

Genus PSEUDOGRAMMA

Pseudogramma Bleeker 1875. Verh. Akad. Amsterdam, vol. 15, p. 24. (Type species, Pseudochromis polyacanthus Bleeker).

Pseudogramma polyacantha

Pseudochromis polyacanthus Bleeker 1856. Nat. Tijdschr. Ned.-Ind., vol. 10, p. 375. (Type locality, Ternate).

7 specimens. 30 - 48 mm. Onotoa.

1 specimen. 34 mm. Tarawa.

D VII,20; A III,16 or 17; V I,5; P 17; scale rows from upper end of gill opening to base of caudal fin 51 and 52. (2 specimens).

Color in alcohol brown with round light brown spots larger than pupil of eye in approximately five rows on body (those ventrally tend to merge); a round dark brown spot larger than pupil of eye on opercle at level of eye; two irregular narrow dark streaks running posteriorly from lower part of eye; median fins dark brown with narrow pale margins; paired fins pale, the pectorals dusky at base.

The Onotoa specimens were collected from the west reef of the atoll at poison station IV. The Tarawa specimen was taken from a surge channel.

Pseudogramma bilinearis

Aporops bilinearis Schultz 1943. Bull. U. S. Nat. Mus. 180, pp. 111, 112, fig. 9. (Type locality, Hull Island, Phoenix Islands).

5 specimens. 26 - 55 mm. Onotoa.

5 specimens. 34 - 60 mm. Tarawa surge channel.

D VII,24; A III,20; V I,5; P 16; scale rows from upper end of gill opening to base of caudal fin 63 and 65. (2 specimens).

Color in alcohol brown with round dark brown spots about the size of the pupil and vertically elongate dark brown spots on body; median fins brown, a little darker on basal scaled portions; paired fins paler than median fins.

Schultz (1943) erected the genus Aporops for this one species of pseudochromid primarily on the basis of an increased number of soft fin rays in the dorsal and anal fins and the lack of a pair of large pores in the interorbital space, such as is seen in Pseudogramma polyacantha. In my opinion these differences do not warrant generic distinction.

Genus PSEUDOPLESIOPS

Pseudoplesiops Bleeker 1858. Nat. Tijdschr. Ned.-Ind., vol. 15, p. 215. (Type species, *Pseudoplesiops typus* Bleeker).

Pseudoplesiops rosae

Pseudoplesiops rosae Schultz 1943. Bull. U. S. Nat. Mus. 180, pp. 111, 117, fig. 11. (Type locality, Rose Island, Samoa Islands).

1 specimen. 20 mm. Onotoa.

D 22; A 13; V I,3: P 17; scales from upper end of gill opening to base of caudal fin 30.

Color in alcohol light brown.

The single specimen was collected from the west reef of the atoll in poison station number IV.

Genus PLESIOPS

Plesiops Oken 1817. Isis, app. p. 1182a. (Type species, *Pharopteryx nigricans* Rüppell).

Plesiops nigricans

Pharopteryx nigricans Rüppell 1828. Atlas Reise im nördlichen Afrika, p. 15, pl. 4, fig. 2. (Type locality, Red Sea).

1 specimen. 88 mm. Onotoa.

2 specimens. 85 and 96 mm. Tarawa.

D XII,7; A III,8; P 20; scales from gill opening to base of caudal fin 27 (1 specimen).

Color in life blackish with small light bluish green spots (one per scale) on body and extending out on fins; a prominent dark-edged blue spot on opercle; a blue line at base of dorsal fin; distal end of pectoral fin and membrane between first branchiostegal ray and opercle bright orange-yellow.

The Onotoa specimen was caught by hand by D. W. Strasburg from beneath a rock in a shallow tide pool just shoreward of the "Lithothamnion ridge" at low tide.

According to Rüppell's description and figure, *P. nigricans* lacks the dark spot on the opercle which is so characteristic of the species in Oceania.

Family APOGONIDAE

This family includes small fishes with relatively large mouths and eyes and two separate dorsal fins. The males of at least some genera incubate the eggs in the mouth. Apogonids are rarely seen underwater as they are nocturnal and are found under rocks or in holes in the coral during the day. There were no Gilbertese names for the species or even for this group of fishes in general.

Lachner in Schultz and collaborators (1953) recorded 22 species of cardinal fishes from the northern Marshall Islands. Sixteen are here listed from the Gilbert Islands, five of which were not reported by Lachner. Undoubtedly more species of this family occur in both areas than have thus far been collected.

Key to the Species of Apogonidae Recorded from the Gilbert Islands

1a. A near-vertical dark brown band from origin of spinous dorsal fin to abdomen between pelvic and anal fins; prominent dark brown spots on head and body; body depth great, about 2 in standard length...Apogon orbicularis

1b. No near-vertical dark brown band on body; no prominent dark brown spots on head and body; body depth not great, about 2.5 to 6 in standard length..............2

2a. Enlarged canine teeth lacking in jaws; body somewhat elevated, its depth contained less than 4 times in standard length; palatine teeth present or absent....3

2b. Enlarged canine teeth, 3 to 6 times longer than remaining villiform teeth, present in jaws; body relatively elongate, its depth contained 4 or more times in standard length; palatine teeth present.............13

3a. First dorsal fin composed of 6 spines (the first spine is small and easily overlooked), the second spine the longest; body pale (transparent red in life) with no definite markings; palatine teeth present...........4

3b. First dorsal fin composed of 7 spines, the third spine the longest; body with definite dark markings; palatine teeth present or absent...........................5

4a. Second dorsal spine very long, 3.6 or less in standard length; profile from snout to origin of first dorsal fin almost straight; posterior margin of preopercle very feebly serrated; 12 pectoral rays...Apogon doryssa

4b. Second dorsal spine of moderate length, 4.2 or more in standard length; profile from snout to origin of first dorsal fin definitely curved; posterior margin of preopercle with obvious serrations; 14 pectoral rays. ....*Apogon erythrinus*

5a. Opercle with a round or elliptical black blotch about two-thirds diameter of eye in width; lateral line incomplete, ending under base of second dorsal fin (though a few pores may be visible posteriorly); no palatine teeth; caudal fin rounded; posterior and anterior margins of preopercle not serrated; posterior end of maxillary extends beyond a vertical through the posterior edge of eye (in young specimens the maxillary may reach only to posterior edge of eye).... 6

5b. Opercle without a round or elliptical black blotch; lateral line complete; palatine teeth present; caudal fin emarginate or forked; posterior margin of preopercle serrated, anterior margin may or may not be serrated; posterior end of maxillary terminates in front of a vertical through posterior edge of eye....7

6a. Somewhat irregular, lengthwise lines of small black spots on body..............................*Apogon isostigma*

6b. No small black spots on body.............*Apogon auritus*

7a. Body with one or a few longitudinal dark stripes; no dark diagonal streak on cheek running from posteroventral edge of eye to posterior margin of preopercle; anterior margin of preopercle smooth or serrated.....8

7b. Body without longitudinal dark stripes; a dark diagonal streak running from eye to posterior margin of preopercle; anterior margin of preopercle smooth....12

8a. Body with 5 longitudinal dark stripes, the uppermost adjacent to dorsal fins; anterior margin of preopercle smooth; suborbital smooth; a dark spot at base of caudal fin may or may not be present (if present, it is centered on the end of the lateral line).........9

8b. Body with only 1 longitudinal dark stripe, this stripe passing from snout through eye to caudal peduncle (in a few specimens this stripe is faint, especially posterior to head); anterior margin of preopercle serrated; suborbital strongly serrated; a dark roundish spot on caudal peduncle near end of, and slightly above, lateral line...............................11

9a. Second and fourth body stripes curve to meet middle body stripe at base of caudal fin; upper and lower margins of caudal fin not narrowly dark brown; median body stripe ends at base of caudal fin in a roundish jet black spot (obscured by stripe in melanistic specimens)...........................*Apogon nigrofasciatus*

9b. Second and fourth body stripes do not curve to meet middle body stripe at base of caudal fin (if second and fourth stripes join median stripe, they do so well out on caudal fin rays); upper and lower margins of caudal fin narrowly dark brown (faint in *novemfasciatus*); median body stripe may or may not end in a black spot (if a spot is present, it appears more as an elliptical enlargement of end of stripe than a distinct spot)..10

10a. Second and fourth body stripes end at base of caudal fin (though traces of dark pigment may extend out on caudal fin rays from stripes); median body stripe enlarged slightly to an elliptical-shaped area at base of caudal fin (usually a little darker than stripe)..*Apogon robustus*

10b. Second and fourth body stripes extend on caudal fin, converging to join or nearly join median stripe near end of fin; median body stripe not enlarged at base of caudal fin.......................*Apogon novemfasciatus*

11a. Body somewhat elongate, its depth contained 3.2 to 3.4 times in standard length; caudal peduncular spot large, 2 to 3.8 in least depth of caudal peduncle; lengthwise body stripe abruptly narrow posterior to head and indistinct on large specimens; pigment on paler regions of body uniform; no dark brown saddle on back beneath second dorsal fin......................*Apogon exostigma*

11b. Body somewhat elevated, its depth contained 2.7 to 2.9 times in standard length; caudal peduncular spot small, 3.4 to 6 in least depth of caudal peduncle; lengthwise body stripe of equal width throughout most of its length; pigment on paler regions of body concentrated on peripheral portions of scales; a dark brown saddle usually on back beneath second dorsal fin...*Apogon snyderi*

12a. Caudal peduncle with a dark saddle dorsally (this saddle reaching midventral line in specimens smaller than approximately 45 mm); a prominent diagonal dark mark on cheek, noticeably broader at edge of eye than at posterior margin of preopercle; a dark band in upper and lower lobes of caudal fin........*Apogon savayensis*

12b. Caudal peduncle without dark markings or with only a small dark spot located slightly above midlateral line; dark mark on cheek very faint, narrow, and of almost uniform width; no dark band in upper and lower lobes of caudal fin..........................*Apogon nubilus*

13a. Posterior margin of preopercle with a single, stout spine and a membranous ventral flap which projects posteriorly; body pale (transparent, with silvery abdomen in life) without any definite dark markings; each pelvic fin united in its entire length with a membrane to mid-ventral line of body; caudal fin forked........................Gymnapogon philippinus

13b. Preopercle lacking a single stout spine and membranous flap; body with a definite pigment pattern; pelvic fins not united with a membrane to body; caudal fin rounded or forked...14

14a. Lateral line incomplete, ending beneath second dorsal fin; anterior preopercular margin not visible externally; opercular margin with a notch at level of maxillary; caudal fin rounded; scales small, about 55 in lengthwise series; body with about 15 longitudinal lines and with small dark spots superimposed on line pattern and on head; a large round black blotch at base of caudal fin, its center above midline of body; an elongate black flap at posterior edge of anterior nostril.........Pseudamia polystigma

14b. Lateral line complete; anterior preopercular margin evident externally; no notch in opercular margin; caudal fin forked; scales large, 25 in lengthwise series; body with 5 longitudinal dark lines, 3 of these extending past ends of second dorsal and anal fins; a black spot contained in a pale area in midline at base of caudal fin; anterior nostril tubular. 15

15a. Tip of lower jaw without enlarged canine teeth.......... ....Cheilodipterus quinquelineatus

15b. Tip of lower jaw on each side of symphsis with 1 or 2 enlarged canine teeth.........Cheilodipterus isostigma

Genus APOGON

Apogon Lacépède 1802. Hist. nat. poiss., vol. 3, p. 411. (Type species, Apogon ruber Lacépède).

Apogon orbicularis

Apogon orbicularis (Kuhl and Van Hasselt) Cuvier and Valenciennes 1828. Hist. nat. poiss., vol. 2, p. 155. (Fowler, 1928, gives the type locality as Java).

Amia orbicularis Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 154. (Kingsmill Islands).

Apogon doryssa

Amia doryssa Jordan and Seale 1906. Bull. U. S. Bur. Fish., vol. 25, p. 245, fig. 39. (Type locality, Apia, Samoa).

2 specimens. 23 and 36 mm. Onotoa.

D VI-I,9; A II,8; P 12. (2 specimens).

Color in life was probably transparent red, as this species was not distinguished in the field from Apogon erythrinus which is this color. The color in alcohol is pale with traces of black pigment anteriorly at base of each dorsal fin and at base of caudal fin.

Apogon doryssa differs from A. erythrinus principally in having a stouter and longer second dorsal spine, a straighter profile from the snout to the origin of the dorsal fin, and 12 instead of 14 pectoral rays.

The holotype was examined and compared with the two specimens from the Gilbert Islands.

Apogon doryssa appears to be a rather rare species, in contrast to the usually abundant Apogon erythrinus. There may be habitat differences between the two species. The specimens of erythrinus were taken from the lagoon or shallow channel between the sea reef and the lagoon. A. doryssa was obtained from the sea side of the atoll, though in a well-protected area of numerous small coral heads.

Apogon erythrinus

Apogon erythrinus Snyder 1904. Bull. U. S. Fish. Comm., vol. 22, p. 526, pl. 9, fig. 17. (Type locality, Puako Bay, Hawaii).

9 specimens. 23 - 30 mm. Onotoa.

D VI-I,9; A II,8; P 14; vertical scale rows 22 to 24. (4 specimens).

Color in life transparent red. Color in alcohol pale, usually with a small elongate patch of tiny black specks posteriorly and midlaterally on caudal peduncle. Occasional specimens with tiny specks of dark pigment scattered on the body; often the outer edges of scales appear slightly darker than the central portions. All of the above-mentioned pigmentation is inconspicuous, however, and the general color effect is of a uniformly pale fish.

The type was examined. This and other Hawaiian specimens had more tiny dark spots on the body than the specimens from the Gilbert Islands, and they appear to be of larger average size.

Apogon isostigma

Apogonichthys isostigma Jordan and Seale 1906. Bull. U. S. Bur. Fish., vol. 25, p. 251, fig. 45. (Type locality, Apia, Samoa).

7 specimens. 30 - 58 mm. Onotoa lagoon and sea reef.

D VII-I,9; A II,8; P 14; vertical scale rows 21 to 23. (3 specimens).

Color in alcohol brown with a prominent roundish black spot on opercle and numerous small dark spots in approximate linear series on body; a horizontal dark line above opercular spot; two dark lines extending posteriorly and slightly downward from lower portion of eye (the lower line is narrow and the upper line, which extends to margin of preopercle at level of opercular spot, is broader and more diffuse); area on cheek between these two lines and around the opercular spot paler than rest of head; fins dusky, especially the caudal, which has a pale edge posteriorly (this pale edge narrower in median portion of fin). A 17 mm specimen from the Marshall Islands can be identified as isostigma; however, the lines of spots on the body are not apparent, though scattered small spots occur.

The type was examined.

In contrast to Schultz's statement (1943: 93) that palatine teeth are usually present in this species, none were found in any of the specimens from the Gilbert Islands. Jordan and Seale (1906) utilized the lack of palatine teeth, along with the opercular spot and interrupted lateral line as a basis for including isostigma in Apogonichthys Bleeker.

Apogon auritus

Apogon auritus Cuvier and Valenciennes 1831. Hist. nat. poiss., vol. 7, p. 443. (Type locality, Mauritius).

6 specimens. 26 - 38 mm. 2 specimens. 62 and 72 mm. Onotoa.

D VII-I,9; A II,8 or 9 (usually 8); P 14; vertical scale rows 24 or 25. (3 specimens).

Gill rakers of the two large specimens 14 (counting rudiments).

Color in alcohol brown with a prominent round or elliptical black spot on opercle, relatively larger in smaller specimens (in large specimens the anterior portion of the spot is slightly covered by the preopercle); a short horizontal dark line visible above opercular spot (this is rather indistinct in large specimens); two or three dark lines extending posteriorly from eye as in A. isostigma (in the large specimens only the lowermost of these lines is distinct). Small specimens exhibit vertical dusky bars on the body. The 38 mm specimen has traces of these bars and is considered intermediate between the adult and juvenile color pattern. This specimen is a sexually mature female. Color in life orange-brown.

The species was collected from both the lagoon and the outer reef.

Apogon nigrofasciatus

Apogon nigrofasciatus Lachner in Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, vol. 1, p. 466, fig. 81. (Type locality, Bikini Atoll, Marshall Islands).

17 specimens. 28 - 64 mm. Onotoa lagoon and outer reef.

D VII-I,9; A II,8; P 14; vertical scale rows 24 or 25.

Color in alcohol pale with 5 longitudinal dusky to black stripes on the body, all converging on the head (the first stripe is located mid-dorsally; the third stripe passes from snout through eye to base of caudal fin; stripes above and below this stripe extend on to caudal peduncle, and all three merge at base of caudal fin). The stripes do not extend on to the caudal fin rays. In specimens in which the stripes are not very dark, a black spot is visible mid-laterally at the base of the caudal fin. An oblique dark streak may be seen basally in the second dorsal and anal fins.

In life the body was reddish and the fins pale red. The stripes on the body varied from golden through dusky yellow to black. This variability in coloration occurred in specimens taken in the same poison station.

Apogon nigrofasciatus appears to be very closely related to Apogon aroubiensis Hombron and Jacquinot. Lachner (1953) separated the two on the basis of slightly different gill raker counts, larger size of nigrofasciatus at maturity, and broader, browner stripes in aroubiensis; however, these two species have not yet been collected from the same island group, aroubiensis being characteristically East Indian and nigrofasciatus from Oceania (Marshall Islands, Mariana Islands, Samoa, and Austral Islands). It is possible that these two forms are merely subspecies of one wide-ranging species. They are however, about as easily separated as other species in the difficult "fasciatus" complex, such as nomemfasciatus, robustus, and angustatus.

Apogon robustus

Amia robusta Smith and Radcliffe 1912. Proc. U. S. Nat. Mus., vol. 41, p. 255, fig. 2. (Type locality, Jolo Reefs, Philippine Islands).

Amia novemfasciata Jordan and Seale (in part) 1906. Bull. U. S. Bur. Fish., vol. 25, p. 242, fig. 37.

1 specimen. 58 mm. Tarawa surge channel.

D VII-I,9; A II,8; P 14; vertical scale rows 24.

This species is colored much like nigrofasciatus. It differs chiefly in the lack of a round black spot at the base of the caudal fin, in the failure of the second, third, and fourth body stripes to merge at the base of the caudal fin, and in the extension of these stripes faintly on to the caudal fin rays. There is a trace of black pigment on the uppermost and lowermost principal rays of the caudal fin. Figure 37 of Jordan and Seale (1906) portrays a Samoan specimen of this species, considered by these authors as a color variety of Apogon novemfasciata. The specimen from the Gilbert Islands appears very much like this figure, but the posterior end of the middle body stripe is not as broad or as dark and there is no slight convergence of the stripes above and below the middle stripe toward the end of the middle one. Such marking seems to be characteristic of specimens from Guam and the Marshall Islands as well as Samoa. The specimen from the Gilbert Islands differs further from Jordan and Seale's figure in lacking the broadening of the stripe on the cheek anterior to the base of the pectoral fin, and thus it possesses a relatively large silvery area on the operculum above the pectoral base. The isthmus, abdomen, and side of the body to the end of the pectoral fin is somewhat silvery in the preserved specimen.

Apogon novemfasciatus

Apogon novemfasciatus Cuvier and Valenciennes 1828. Hist. nat. poiss., vol. 2, p. 154. (Type locality, Timor and Guam).

Apogon fasciatus Günther (in part) 1873. Jour. Mus. Godeffroy, vol. 2, pt. 3, p. 19, pl. 20, fig. B. (Kingsmill Islands).

Apogon exostigma

Amia exostigma Jordan and Starks in Jordan and Seale 1906, Bull. U. S. Bur. Fish., vol. 25, p. 238, fig. 31. (Type locality, Apia, Samoa).

Apogon fraenatus Lachner in Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, vol. 1, p. 451.

6 specimens. 36 - 61 mm. Onotoa.

D VII-I,9; A II,8. P 13. vertical scale rows 24. (3 specimens).

Color in alcohol light brown with a black stripe extending from snout through eye to middle of base of caudal fin (this stripe narrows abruptly posterior to head; in larger specimens the portion of the stripe on the body is faint); a small black spot posteriorly on caudal peduncle, generally just above lateral line; a faint dark line basally in second dorsal and anal fins; upper and lower margins of caudal fin narrowly dark; body and head finely speckled with dark spots, especially ventrally (these spots are relatively larger and darker in smaller specimens).

This species may be confused with Apogon snyderi Jordan and Evermann or Apogon fraenatus Valenciennes, both of which are characterized by a single median longitudinal stripe and a caudal peduncular spot. Lachner (1953) recorded fraenatus from the Marshall Islands and separated it from exostigma on the basis of the caudal peduncle spot being above the lateral line in the latter species and both above and below in fraenatus. Upon examining the specimens identified as fraenatus from Bikini, I conclude that they are actually exostigma in which some of the spot pigment appears below the lateral line tube. I believe that fraenatus may be a Philippine and East Indian form that does not occur in the rest of Oceania. Specimens of fraenatus from the Philippines display a more prominent and uniform body stripe and a slightly larger and rounder caudal peduncular spot which is centered on the lateral line. Apogon exostigma may be separated from snyderi, as indicated in the key, in its being a more slender and less melanistic fish.

Specimens of exostigma were obtained from both lagoon and outer reef areas.

Apogon snyderi

Apogon snyderi Jordan and Evermann 1903. Bull. U. S. Fish Comm., vol. 22, p. 180. (Type locality, Honolulu).

42 specimens. 41 - 83 mm. Onotoa.

D VII-I,9; A II,8; P 14; vertical scale rows 24 or 25. (4 specimens).

The gill raker counts of 12 specimens were 17 to 19 (mostly 18).

Color in alcohol light brown with a dark brown stripe (in average width about seven-eighths the height of a body scale) running from snout through eye to base of caudal fin (the intensity of this stripe varies considerably from specimen to specimen; in some it is barely visible); a dark brown spot of variable size posteriorly on caudal peduncle (this spot is usually located entirely above the lateral line, but in occasional specimens a small amount of pigment may extend below it); body scales narrowly rimmed in dark brown (in paler specimens this coloration of the scales is most evident on the nape); a narrow dark line basally in the second dorsal and anal fins running parallel with contour of body; anterior portion of first dorsal fin black; upper and lower margins of caudal fin dark brown; first two rays of pelvic fins with some black pigment; most specimens with a marked concentration of dark brown color below the second dorsal fin. In addition to this dark, saddle-like area many specimens are dark along the dorsal aspect of the body, especially posteriorly on the caudal peduncle where the pigment tends to obscure the outline of the spot in this region. In some specimens there is a concentration of dark brown pigment anteriorly on the lateral line. In life the body has a light lavender or pinkish cast, and the pectoral and caudal fins are faintly pink.

The Gilbert Islands specimens were compared with the type from Hawaii, with Samoan specimens, and with specimens from the Marshall Islands. They tend to be more melanistic than the others, especially those from the Marshall Islands, and the anterior preopercular serrations are not so well developed.

Apogon snyderi was abundant at Onotoa, where it was obtained from the lagoon, channel, and outer reef.

This species seems to reach much larger size in Hawaii than the rest of Oceania. In Hawaii it may attain a standard length of about 180 mm, a very large size for an apogonid. Of 369 specimens from the Marshall Islands, the largest was 97 mm.

As far as is known, this species is not recorded from the Philippines, East Indies, or more western waters. Its distribution suggests that it might be a Hawaiian endemic form that has drifted southward and become established in the major island groups of the South and Central Pacific. The closely related Hawaiian species, Apogon menesemus Jenkins, may be exhibiting the same pattern of distribution in an incipient stage; Apogon menesemops Lachner is recorded only from the northern Marshall Islands. Lachner's specimens are probably only subspecifically different from Apogon menesemus.

The stomach contents from 10 specimens of snyderi, which were collected during daylight hours, were examined. One had eaten a small fish which was half digested. Another contained unidentified organic matter with a few small pieces of hard substance which are probably crustacean fragments. The remaining stomachs were empty.

Apogon savayensis

Apogon savayensis Günther 1871. Proc. Zool. Soc., p. 656. (Type locality, Savaii, Samoa).

15 specimens. 34 - 94 mm. Onotoa lagoon and outer reef.

D VII-I,9; A II,8 or 9 (usually 9); P 13; vertical scale rows 23 or 24. (4 specimens).

Color of body in alcohol dark brown dorsally, shading into light brown below lateral line; head and nape dark brown; a dark brown saddle on caudal peduncle (in small specimens this mark extends as a band to midventral line); a prominent diagonal dark line on cheek extending posteriorly and downward from lower rear quadrant of eye. Fins dusky; a dark submarginal band in the upper and lower lobes of the caudal fin. Vertical dusky bars may be seen on the sides of some specimens.

Apogon nubilus

Apogon nubilus Garman 1903. Bull. Mus. Comp. Zoöl., p. 229, pl. 1, fig. 1. (Type locality, Suva, Fiji Islands).

7 specimens. 38 - 84 mm. Onotoa.

D VII-I,9; A II,8; P 13; vertical scale rows 24 or 25. (3 specimens).

Color in alcohol light brownish with body and head very finely and uniformly speckled with tiny black dots. A few specimens show vertical concentrations of these tiny dots to form faint bars on the body. A very faint and narrow diagonal mark is visible on the cheek as in savayensis. Only one specimen has a spot on the caudal peduncle above the lateral line. In all specimens the fins are dusky, especially the first dorsal fin.

Color in life: back brownish, sides silvery with a lavender cast.

All 7 specimens were taken from one Heliopora coral head in shallow water of a sandy channel connecting lagoon and the open ocean. Such a distinctive habitat, if shown to be consistent, may separate this species ecologically from the closely related A. savayensis. Lachner (1951) discussed the

the morphological distinctness of these two species and A. bandanensis Bleeker.

Gymnapogon philippinus

Henicichthys philippinus Herre 1939. Copeia, no. 4, p. 200. (Type locality, Dumaguete, Oriental Negros, Philippine Islands).

5 specimens. 11.5 - 24 mm. Onotoa.

D VI-I,9 or 10 (mostly 9); A II,8; P 15. (4 specimens).

Color in alcohol uniform pale yellowish with melanophores forming numerous individual tiny spots over brain and usually with a few in mid-dorsal line posterior to second dorsal fin. In one 13 mm specimen the pelvin fins were dusky. There is in all specimens a criss-crossing of short straight lines of papillae on the head which become whitish when the specimens dry and the papillae are penetrated by air. Color in life transparent with silver on operculum and over abdomen; an orange-red line on body from region of pectoral fin to middle of base of caudal fin; an orange-red line at base of dorsal and anal fins.

These 5 specimens were compared with a 28 mm paratype of Henicichthys philippinus Herre. The following differences were discernible: small black spots on tip of jaws in the latter, different pattern of papillae, and a lavender-silver sheen on the preopercle. Color in life, as described by Herre, was translucent rose with a bluish pearly lustre. Regards body form, fin ray counts, and especially dentition (the characteristics which Lachner in Schultz and collaborators (1953) has set down in tabular form for the known species of Gymnapogon) the Gilbert Island and Philippine specimens were identical. It is therefore believed that the differences mentioned above may be only subspecific.

The specimens were obtained from the first 175 feet of a transect of the outer reef flat at Onotoa at low tide. They were in small, shallow tide pools which contained sparse algal growth and in which the temperature during the day sometimes reached or exceeded 40° C.

Gymnapogon has been classified in various families, and its affinities with the Apogonidae often questioned. Lachner (1953) has discussed the genus in detail and prefers to include it within the Apogonidae, though as a distinct subfamily. I do not believe that this is advisable in view of the characters of the monotypic genus Pseudamia which serve to connect Gymnapogon with more typical genera of the family. Gymnapogon is naked whereas other apogonid genera have large, well-formed scales; Pseudamia has small thin scales which tend to fuse on the body. Gymnapogon possesses a single spine at the angle of the preopercle; small Pseudamia have several small spines at this location; the pattern of the lines of pores on the head of Pseudamia is very similar to the lines of papillae on Gymnapogon. Total gill raker counts (including rudiments) of Gymnapogon 11 to 12; of Pseudamia, 14.*

Genus PSEUDAMIA

Pseudamia Bleeker 1865. Ned. Tijdschr. Dierk., vol. 2, p. 284. (Type species, Cheilodipterus polystigma Bleeker).

Pseudamia polystigma

Cheilodipterus polystigma Bleeker 1859-1860. Nat. Tijdschr. Ned.-Ind., vol. 20, p. 454. (Type locality, Singapore).

Pseudamia polystigma Weber and de Beaufort 1929. Fishes Indo-Austral. Arch., vol. 5, p. 370, fig. 90.

2 specimens. 47 and 70 mm. Onotoa.

1 specimen. 25 mm. Abemama.

D VI-I,9; A II,9. P 15; vertical scale rows about 50. (2 specimens).

Color of 70 mm specimen in alcohol light brown with numerous small dark spots on head and body; narrow, somewhat irregular, longitudinal dark lines on body: a large round dark blotch posteriorly on caudal peduncle, displaced slightly above mid-lateral point of body; a black spot in middle of upper 5 or 6 caudal fin rays; a black elongate flap posteriorly on the anterior nostrils; median fins dusky, especially the caudal, with outer margins pale; paired fins pale or faintly dusky. Color in life bluish silver with brown lines and spots; dorsal fins and anal fin purplish brown, edged in white; caudal peduncular spot and caudal fin dark blue to purple.

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*After the above was written, a paper by J.L.B. Smith entitled "Apogonid fishes of the subfamily Pseudamiinae from south-east Africa" appeared in the Annals and Magazine of Natural History, ser. 12, vol. 7, pp. 775-795, October, 1954. Smith arrived at the same conclusion regarding the close affinity of Pseudamia and Gymnapogon; however I question his consideration of these two genera and the new genus Pseudamiops as a subfamily within the Apogonidae. I believe this subfamily should be re-evaluated in terms of the characteristics of the genus Cheilodipterus Lacépède.

The 25 mm specimen, which was collected by Catala at Abemama Atoll, has no dark spot on the caudal peduncle, but only the one on the upper part of the caudal fin; there are no dark lines on the body; the dorsal and anal fins are hyaline. The 47 mm specimen, however, is intermediate in color to the 25 and 70 mm specimens.

The small specimen has several indistinct spines at the angle of the preopercle, and criss-crossed on the head are prominent short rows of pores (these pores are present on the larger specimens but are not distinct).

Pseudamia polystigma serves as a link between the bizarre Gymnapogon and more typical apogonids. See further discussion under Gymnapogon.

The 47 mm specimen was taken from a shallow water area of the lagoon where there was considerable turtle grass (Thalassia) and occasional coral rocks. The large specimen was taken from a poorly defined surge channel region on the lee side of the atoll where the bottom was mostly coral-covered.

Genus CHEILODIPTERUS

Cheilodipterus Lacépède 1802. Hist. nat. poiss., vol. 3, p. 539. (Type species, Cheilodipterus lineatus Lacépède, as restricted by Cuvier and Valenciennes).

Paramia Bleeker 1863. Ned. Tijdschr. Dierk., vol. 1, p. 233.

Cheilodipterops Schultz 1940. Proc. U. S. Nat. Mus., vol. 88, p. 413.

Cheilodipterus quinquelineatus

Cheilodipterus quinquelineatus Cuvier and Valenciennes 1828. Hist. nat. poiss., vol. 2, p. 167. (Type locality, Bora Bora, Society Islands).

Paramia quinquelineata Bleeker 1865. Ned. Tijdschr. Dierk., vol. 2, p. 147.

Cheilodipterus quinquelineatus Weber and de Beaufort 1929. Fishes Indo-Austral. Arch., vol. 5, p. 361.

Jadamga quinquelineata Schultz 1940. Proc. U. S. Nat. Mus., vol. 88, p. 416. (Corrected to Paramia quinquelineata by Schultz, 1940; Copeia, no. 3, p. 203.).

Paramia quinquelineata Lachner 1951. Proc. U. S. Nat. Mus., vol. 101, p. 606.

1 specimen. 35 mm. Onotoa channel.

Color in alcohol very light brown with five longitudinal dark brown lines on the head and body, the pale interspaces between the stripes being two to three times as broad as the stripes themselves; a round black spot centered on lateral line at base of caudal fin, this spot surrounded by an unpigmented area (yellow in life). The first body stripe lies in mid-dorsal line, beginning in the interorbital space and bifurcating to surround base of the two dorsal fins; the second stripe runs from snout through top of eye, ending at edge of pale area on caudal peduncle; the third stripe runs down middle of body from snout to caudal peduncle; the fourth extends from the chin through lower edge of eye to caudal peduncle; the fifth stripe is double on chin, triple in pelvic region, double around anal fin, and a single mid-ventral line on caudal peduncle.

I am in agreement with Weber and de Beaufort (1929) in not separating this species into another genus, Paramia.

Cheilodipterus isostigma

Cheilodipterops isostigma Schultz 1940. Proc. U. S. Nat. Mus., vol. 88, p. 413. (Type locality, New Guinea).

1 specimen. 40 mm. Onotoa lagoon.

Color as in Cheilodipterus quinquelineatus, except the stripes on the chin and abdomen, which are less distinct.

C. isostigma is very difficult to distinguish from C. quinquelineata without examination of the teeth at the tip of the lower jaw where the presence of one or two canines in isostigma affords a consistent means of separation. Since both species possess canines, I do not believe that their presence or absence in one place in the jaws constitutes a generic difference as indicated by Schultz (1940).

Family KUHLIIDAE

Genus KUHLIA

Kuhlia Gill 1861. Proc. Acad. Nat. Sci. Phila., p. 48. (Type species, Perca ciliata Cuvier).

Kuhlia marginata

Dules marginatus Cuvier and Valenciennes 1829. Hist. nat. poiss., vol. 3, p. 116, pl. 52. (Type locality, Java).

1 specimen. 154 mm. Nukunau.

D X,11; A III,11; P 14; lateral line scales 56 (last 4 posterior to base of caudal fin); median predorsal scales 12.

The gill arches have been removed; therefore no gill raker counts are given. The specimen appears to have been dried before preservation. No distinctive color markings (such as black margin to caudal fin) are apparent.

Kuhlia taeniura

Dules taeniurus Cuvier and Valenciennes 1829. Hist. nat. poiss., vol. 3, p. 114. (Type locality, Java).

Dules argenteus Günther 1873. Jour. Mus. Godeffroy, vol. 2, pt. 3, p. 25, pl. 19, fig. C. (Kingsmill Islands).

Kuhlia taeniura Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 171. (Abaiang, Gilbert Islands).

Moronopsis taeniurus Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 292. (Ocean Island).

1 specimen. 62 mm. Tarawa.

D X,10; A III,11; P 14; lateral line scales 56 (last 5 posterior to base of caudal fin); median predorsal scales 11; gill rakers 10-1-23.

Color in alcohol: back blackish, remainder of body tan; caudal fin with 5 black bands, 1 median and 2 on each lobe; spinous dorsal with attenuated ends of membranes black; soft dorsal with broad black band in outer part of fin.

Family PRIACANTHIDAE

Genus PRIACANTHUS

Priacanthus Oken 1817. Isis, p. 1183. (Type species, Anthias macrophthalmus Bloch).

Priacanthus cruentatus

Labrus cruentatus Lacépède 1802. Hist. nat. poiss., vol. 3, pp. 452, 522. (Type locality, Martinique).

11 specimens. 85 - 220 mm. Onotoa.

D X,13; A III,14; P 17 or 18 (usually 18). (7 specimens). lateral line scales 63 and 69; gill rakers 23. (2 specimens).

Color in life red, blotched with silver; median fins reddish with small reddish brown spots; paired fins pale reddish.

The specimens were taken in coral areas of the lagoon and protected outer reef.

Family SCOMBRIDAE

Genus NEOTHUNNUS

Neothunnus Kishinouye 1923. Jour. College Agric. Tokyo Univ., vol. 8, p. 445. (Type species, Thynnus macropterus Temminck and Schlegel).

Neothunnus macropterus

Thynnus macropterus Temminck and Schlegel 1844. Fauna Japonica, Poissons, p. 98, pl. 51. (Type locality, Nagasaki).

1 specimen. 720 mm (only dorsal and anal fins saved). Onotoa.

Genus EUTHYNNUS

Euthynnus Lütken in Jordan and Gilbert 1882. Bull. U. S. Nat. Mus. 16, p. 429. (Type species, Thynnus thunnina Cuvier and Valenciennes).

Euthynnus yaito

Euthynnus yaito Kishinouye 1915. Suisan Gakkwai Ho (Proc. Sci. Fish. Assoc.), vol. 1, p. 22, pl. 1, fig. 15. (Type locality, Japan).

2 specimens. 265 and 340 mm. Onotoa.

1 specimen. 120 mm. Tarawa.

Genus ACANTHOCYBIUM

Acanthocybium Gill 1862. Proc. Acad. Nat. Sci. Phila., vol. 14, p. 125. (Type species, Cybium sara Bennett).

Acanthocybium solandri

Cybium solandri Cuvier and Valenciennes 1831. Hist. nat. poiss., vol. 8, p. 192. (Type locality, open seas).

1 specimen (only head saved). Length of head about 250 mm. Onotoa.

Family HISTIOPHORIDAE

Genus HISTIOPHORUS

Istiophorus Lacépède 1803. Hist. nat. poiss., vol. 3, p. 274. (spelling corrected to Histiophorus by Cuvier and Valenciennes 1831: 291) (Type species, Istiophorus gladifer Lacépède).

Histiophorus gladius

Scomber gladius Broussonet 1786. Mém. Acad. Sci., p. 454.

1 specimen. 1500 mm (not retained for collection). Onotoa, offshore.

D XLVII-6; A XI-7.

Color from 35 mm Kodachrome transparency dark blue on back, shading to light blue on side and silvery white ventrally; fins dark blue.

Distance from tip of sword to eye 3.9 in fork length; longest dorsal spine about 3 in fork length; second dorsal fin follows first by a distance less than twice the least depth of the caudal peduncle; paired keels at base of caudal fin; length of pectoral fin slightly greater than body depth; pelvic fins with one spine and one ray prolonged to 420 mm.

I identify this species as H. gladius from the key, descriptions, and photograph of H. orientalis in the work of de Beaufort and Chapman (1951: 240-242).

Genus MAKAIRA

Makaira Lacépède 1802. Hist. nat. poiss., vol. 4, pp. 688, 689. (Type species, Makaira nigricans Lacépède).

Makaira sp.

The sword from a large marlin was obtained from a Gilbertese fisherman who stated that he had caught the specimen at Onotoa. The specimen was not seen by me.

Family GEMPYLIDAE

Genus PROMETHICHTHYS

Promethichthys Gill 1893. Mem. Nat. Ac. Sci., vol. 6, pp. 115, 123. (Type species, *Prometheus atlanticus* Lowe).

Promethichthys prometheus

Gempylus prometheus Cuvier and Valenciennes 1831. Hist. nat. poiss., vol. 8, p. 213. (Type locality, St. Helena).

Promethichthys prometheus Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 293. (Ocean Island).

Genus RUVETTUS

Ruvettus Cocco 1833. Giorn. Sci. Sicilia, vol. 42, p. 2. (Type species, *Ruvettus pretiosus* Cocco).

Ruvettus tydemani

Ruvettus Tydemani Weber 1913. Siboga Exp. Fische, p. 401. (Type locality, Binongka Island).

Ruvettus tydemani Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 293. (Ocean Island and Nauru).

Fowler (1928: 135) maintains that *Ruvettus tydemani* Weber is not different from the Atlantic *Ruvettus pretiosus* Cocco.

Family CARANGIDAE

The jacks represent one of the dominant families of fishes in the Gilbert Islands, as elsewhere in tropical marine waters. Fast swimming and mainly piscivorous, fishes of this group fill the niche of "roving carnivore" on the reef more than those of any other group.

The most important family characteristic is the presence of two isolated anal spines anterior to the anal fin proper.

Genus ELAGATIS

Elagatis Bennett 1840. Narrative of a whaling voyage around the globe, vol. 2, p. 283. (Type species, Seriola bipinnulata Quoy and Gaimard).

Elagatis bipinnulatus

Seriola bipinnulata Quoy and Gaimard 1824. Voyage autour du monde..."Uranie"...Zool., p. 363, pl. 61, fig. 3. (Type locality, "Iles des Papous").

1 specimen (only the head saved). 580 mm. Onotoa.

D VI-I,24-2; A II-I,17-2.

The specimen was caught by Gilbertese fishermen by trolling off the edge of the west reef of the atoll. Dorsal and anal fin ray counts were made and the head was purchased.

Genus SCOMBEROIDES

Scomberoides Lacepède 1802. Hist. nat. poiss., vol. 3, p. 50. (Type species, Scomberoides commersonianus Lacépède).

Scomberoides sanctipetri

Chorinemus Sancti Petri Cuvier and Valenciennes 1831. Hist. nat. poiss., vol. 8, p. 379, pl. 236. (Type locality, coast of Malabar).

Chorinemus sanctipetri Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 292. (Nauru).

2 specimens. 340 and 390 mm. Onotoa.

2 specimens. 251 and 318 mm. Tarawa.

D VI or VII-I,20; A II-I,18 or 19; P 17 or 18; gill rakers 25 or 26 plus 2 tiny rudiments. (2 specimens).

Color from 35 mm Kodachrome transparency light silvery blue on back shading to silvery white on sides and ventrally; a row of faint dusky roundish blotches on side of body just above lateral line; 3 or 4 similar blotches mid-laterally on body below lateral line in a row just posterior to tip of pectoral; a large black spot on the dorsal fin between the first and sixth soft rays (this spot covers all but the basal part of this section of the fin); anal fin pale with a blackish spot anteriorly; caudal fin purplish; pectoral fin dusky; pelvic fins white.

Eye 4.6 in head; maxillary reaches slightly posterior to vertical from hind edge of eye; depth of body 4.4 in standard length; length of pectoral fin 1.5 in head length; first 6 or 7 dorsal spines and first 2 anal spines isolated; posterior rays of dorsal and anal occur as separate finlets; course of lateral line, especially anteriorly, irregular.

The two Onotoa specimens were taken with rotenone on the lagoon side of the west reef. When first brought from the water they had a yellowish cast ventrally. The largest Tarawa specimen was speared from a boat anchored in the lagoon after it was attracted by night lighting.

Kendall and Goldsborough (1911: 267) and Fowler (1928: 140) recorded *Scomberoides tolooparah* (Cuvier) from the Gilbert Islands. The former authors suggested that *tolooparah* might be the young of *S. sanctipetri*.

Genus DECAPTERUS

Decapterus Bleeker 1851. Nat. Tijdschr. Ned.-Ind., vol. 1, p. 352. (Type species, *Caranx kurra* Cuvier and Valenciennes).

Decapterus muroadsi

Caranx murcadsi Temminck and Schlegel 1844. Fauna Japonica, p. 108, pl. 58, fig. 1. (Type locality, Japan).

1 specimen. 220 mm. Tarawa.

D VIII-I,34-1; A II-I,28-1; P 23; gill rakers 49.

Color in alcohol brown with a black spot on margin of opercle above the posterior projection of the opercular membrane at level of upper edge of base of pectoral.

Depth of body 5.3 in standard length; body almost cylindrical, body width 1.2 in body depth; no teeth in jaws, on vomer, or palatines; adipose eyelid well developed, maximum width of the open slit over pupil contained more than 3 times in diameter of eye.

Many of the scales and scutes were missing; hence no scale or scute counts were made.

Genus TRACHUROPS

Trachurops Gill 1862. Proc. Acad. Nat. Sci. Phila., p. 238. (Type species, *Scomber plumieri* Bloch = *Scomber crumenopththalmus* Bloch).

Trachurops crumenophthalmus

Scomber crumenophthalmus Bloch 1793. Natur. ausländ. Fische, vol. 7, pt. 10, p. 77, pl. 343. (Type locality, Acara Bay, West Africa).

1 specimen. 128 mm. Tarawa.

1 specimen. 148 mm. Nukunau.

D VIII-I,27; A II-I,22; P 21; gill rakers 37. (1 specimen).

Color in alcohol: upper half of body brown, lower half light brown; tips of jaws slightly blackish.

Depth of body 3.7 in standard length; maximum width of body 1.8 in depth; small teeth in jaws, on vomer, palatines, and tongue; adipose eyelid well developed, maximum width of open slit over pupil contained about 3 times in diameter of eye.

The specimens are in poor condition and scale and scute counts could not be made.

Genus CARANX

Caranx Lacépède 1802. Hist. nat. poiss., vol. 3, p. 57. (Type species, *Scomber carangus* Bloch = *Scomber hippos* Linnaeus).

Caranx melampygus

Caranx melampygus Cuvier and Valenciennes 1833. Hist. nat. poiss., vol. 9, p. 116. (Type locality, Waigiu, Rawak, Baru, Vanicolo, and Mauritius).

Caranx ascensionis Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 145. (Abaiang, Gilbert Islands).

2 specimens. 345 and 400 mm. 8 specimens. 79 - 127 mm. Onotoa.

5 specimens. 76 - 245 mm. Tarawa.

D VIII-I,22 or 23; A II-I,18 or 19; P 20 or 21; scutes 36 to 41; gill rakers 26 to 27. (4 specimens).

Color from 35 mm Kodachrome transparency of a 600 mm specimen (not saved): upper half of body brownish blue with scattered small black spots; lower half of body white (no sharp demarcation, however, between the upper and lower halves in color); head dark greyish, brownish dorsally and whitish ventrally; median fins bluish; dorsal fin with a bright blue band at base; pectoral fin dusky.

Color in life of 102 mm specimen: back greenish blue, sides and belly silvery white; dorsal and caudal fins bluish; anal fin yellowish, tipped with bluish; upper half of pectoral yellow.

Caranx melampygus was the most abundant species of the genus at Onotoa. It appears to be a roving predator on other reef fishes. Adults were often seen singly or in groups of two to five, constantly on the move and generally in one direction, on the coralliferous terrace of the outer reef. Schools of juveniles were observed in shallow lagoon areas.

The stomach contents of four adult specimens from 250 to 450 mm in standard length were examined. Two of the specimens were taken with rotenone. They had eaten a great many small fish which were undoubtedly earlier results of the poison than the *Caranx* themselves. The two other specimens were speared. The stomach of one contained nothing; the stomach of the other contained two fish, one of which was not identifiable and the other was *Mirolabrichthys tuka*. There was also a mass of fish scales.

Caranx (*hippos?*)

?*Scomber hippos* Linnaeus 1766. Syst. nat., ed. 12, p. 494. (Type locality, Carolina).

Caranx sexfasciatus Quoy and Gaimard 1824. Voyage autour du monde..."Uranie"...Zool., p. 358, pl. 65, fig. 4. (Type locality, "Îles des Papous").

Caranx sexfasciatus Fowler 1928. Bull. B. P. Bishop Mus., vol. 10, p. 149. (Abaiang, Gilbert Islands).

Caranx forsteri Kendall and Goldsborough 1911. Mem. Mus. Comp. Zool., vol. 26, p. 268. (Butaritari, Gilbert Islands).

2 specimens. 59 and 61 mm. Onotoa lagoon.

2 specimens. 85 and 109 mm. Tarawa.

2 specimens. 149 and 176 mm. Butaritari. (*C. forsteri* of Kendall and Goldsborough).

D VIII-I,20 or 21; A II-I,16 or 17; P 20 or 21; scutes 30 to 33; gill rakers 22 to 25. (4 specimens).

Color in alcohol of 59 mm specimen light brown with 6 broad dusky bars extending from mid-dorsal line to about mid-lateral line of body. The 149 and 176 mm specimens no longer show such bars.

I compared the specimens from the Gilbert Islands with Caranx hippos of comparable size from Florida. The meristic data on the few specimens counted are identical. There are a few slight morphological and color differences; however I believe these are only subspecific in magnitude (providing hippos is confined to the Atlantic and sexfasciatus occurs only in the Indo-Pacific region as is apparently the case). The Florida hippos have a prominent blackish spot on the margin of the operculum at the level of the lower part of the eye; in some Gilberts specimens a dusky area may be seen at this same level on the operculum but anterior to the margin. In addition there is a small blackish spot at the upper end of the gill opening. There were minor differences in shape of scutes, pattern of squamation on the cheek, and in dentition. I believe that further study of this problem is advisable.

J. T. Nichols (1910: 159) reported on his examination of the type of Caranx forsteri Cuvier and Valenciennes. From his description it appears to be the same as C. sexfasciatus Quoy and Gaimard of which he made no mention. Nichols considered Caranx marginatus Gill, Caranx rhabdotus (Jenkins), and Caranx elecate (Jordan and Evermann) as synonyms of C. forsteri.

On several occasions at Onotoa I encountered one or two huge individuals of Caranx, probably this species, in surge channels. They appeared to be 4 to 5 feet in length.

Caranx lugubris

Caranx lugubris Poey 1861. Mem. Hist. Nat. Cuba, vol. 2, p. 222. (Type locality, Cuba).

Caranx lessonii Hiyama 1943. Poisonous fishes S. Seas, p. 36, pl. 4, figs. 11 and 12.

3 specimens. 237 - 450 mm. Onotoa.

D VIII-I,22; A II-I,17 to 19; P 22; scutes 28 to 30; gill rakers 26 to 27. (3 specimens).

Color from 35 mm Kodachrome transparency silvery gray; head blackish except cheek and opercle which are silvery gray in areas; fins blackish; scutes, except for central, elevated portions, black.

All three specimens were speared from the coralliferous terrace of the outer reef. This species appeared quite inquisitive and approached a swimmer closely.

The stomachs of two of the specimens were opened. One contained nothing and the other a half-digested fish.

Caranx ignobilis

Scomber ignobilis Forskål 1775. Descr. animalium, pp. xii, 55. (Type locality, Djedda, Red Sea).

Caranx ignobilis Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 292. (Nauru and Ocean Island).

Caranx ferdau

Scomber ferdau Forskål 1775. Descr. animalium, pp. xii, 55. (Type locality, Djedda, Red Sea).

1 specimen. 260 mm. Onotoa.

D ---- I,31; P 24; scutes 30; gill rakers 32.

Color in life light irridescent green above, silvery on sides and below; 7 or 8 small elliptical bright yellow spots scattered in a group on side of body (on the left side these are in the middle of the body and just below the lateral line; on the right side they are slightly posterior to the middle of the body and some above and the rest below the lateral line); elongated anterior part of dorsal and anal fins blue; remainder of these fins and caudal fin bluish gray; pectoral fin faintly yellowish; iris of eye yellowish. Faint vertical dark bars were visible on the fish before it was speared and for a short time thereafter.

The specimen was taken on the coralliferous terrace of the outer reef. It is lacking the spinous dorsal fin; there is evidence of injury to the usual site of this fin in the specimen. The spear damaged the anal fin such that counts of fin rays could not be made.

Caranx speciosus

Scomber speciosus Forskål 1775. Descr. animalium, p. 12. (Type locality, Arabia).

Two individuals of what is tentatively identified as this species were observed underwater off the Island of Aunteuma in the northern part of Onotoa. They were about 2 feet in length and had vertical dark bars on the body as figured for this species by Fowler (1928: pl. 11, fig. C). One was speared but was not captured.

Caranx ciliaris

Zeus ciliaris Bloch 1787. Nat. ausländ. Fische, pt. 3, p. 36, pl. 191. (Type locality, East Indies and Suratte).

Caranx ciliaris Günther 1876. Jour. Mus. Godeffroy, vol. 4, pt. 11, p. 135, pl. 89. (Kingsmill Islands).

Family LUTJANIDAE

Along with the groupers, the snappers are the most important group of carnivorous fishes in the Gilbert Islands. The species are numerous and the individuals of several are abundant.

As will be noted, I have followed Schultz et al (1953) in classifying such genera as Lethrinus, Aphareus, Caesio, Aprion, Gnathodentex, and Monotaxis in the Lutjanidae.

Genus LUTJANUS

Lutjanus Bloch 1790. Natur. ausländ. Fische, vol. 4, pt. 7, p. 105. (Type species, Lutjanus lutjanus Bloch).

Lutjanus vaigiensis

Diacope vaigiensis Quoy and Gaimard 1824. Voyage autour du monde...L'Uranie...Zool., p. 307. (Type locality, Waigiou).

Lutjanus marginatus Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 292. (Nauru).

6 specimens. 61 - 228 mm. Onotoa lagoon.

3 specimens. 141 - 169 mm. Tarawa surge channel.

D X,13 or 14; A III,8; P 16; scale rows from upper end of gill opening to base of caudal fin 47. (2 specimens).

Color in life of a 125 mm specimen: light yellowish gray dorsally shading to yellowish white ventrally; chin, gill membranes, and thorax pure white; spinous portion of dorsal fin light gray with dark red band distally except tips of spines which are white; a line of large orange spots on gray part of spinous portion of dorsal fin; soft part of dorsal fin dusky on basal third and black on upper two-thirds with a narrow dark red band down the middle and a very narrow white margin; caudal fin nearly black with a narrow white margin and a reddish black submarginal area; anal, pectoral, and pelvic fins yellow; upper half of maxillary orange; a small yellow area immediately dorsal and posterior to eye. A 62 mm specimen was colored similarly. It differed in having eight longitudinal yellow lines on the body and hyaline pectoral fins.

The stomachs of six surplus specimens from a Tarawa surge channel (155 to 180 mm in standard length) were opened. Two were empty and two contained small fresh specimens of Thalassoma umbrostygma which had probably been killed by rotenone; one fish had eaten a small holothurian, and the last had made a meal of a small brachyuran crab. The stomachs of two Onotoa specimens, 75 and 95 mm in length, were empty.

Lutjanus monostigmus

Mesoprion monostigma Cuvier and Valenciennes 1828. Hist. nat. poiss., vol. 2, p. 446. (Type locality, Seychelles).

Lutianus monostigma Kendall and Goldsborough 1911. Mem. Mus. Comp. Zoöl., vol. 26, p. 287. (Butaritari, Gilbert Islands).

2 specimens. 80 mm. 1 specimen. 29 mm. Onotoa.

3 specimens. 53 - 117 mm. Tarawa.

D X,13; A III,8; P 16; vertical scale rows from upper end of gill opening to base of caudal fin about 54. (2 specimens).

Color in life very similar to the plate of the species in Hiyama (Poisonous Fishes of the South Seas, 1943: pl. 6, fig. 16) (misidentified as Lutjanus fulviflamma). The lateral line of the Onotoa specimens bissects the black spot on the side. The spot is centered below the base of the second soft ray of the dorsal fin.

The 80 mm Onotoa specimens were taken by Gilbertese from the outer reef flat at night while torchfishing. The 29 mm juvenile was caught in a tide pool of the outer reef flat. A 290 mm adult was obtained near the end of our stay at Onotoa with rotenone from the lagoon side of the west reef, but could not be preserved due to lack of formaldehyde.

Lutjanus bohar

Sciaena bohar Forskål 1775. Descr. animalium, pp. xi, 46. (Type locality, Arabia).

1 specimen. 250 mm. Onotoa.

1 specimen. 285 mm. Tarawa.

D X,14; A III,8; P 17; vertical scale rows from upper end of gill opening to base of caudal fin about 51. (1 specimen).

Color from 35 mm Kodachrome transparency gray dorsally shading to dull red on sides and ventrally with a whitish spot basally on each scale; a prominent white spot, larger than pupil of eye on back adjacent to posterior part of soft dorsal fin; median fins red (except spinous dorsal which is dark reddish gray) with broad dark margins; upper half of pectoral fin dark orange-red, lower half hyaline orange-red; iris golden.

The Onotoa specimen taken was speared from beneath a coral ledge on the coralliferous terrace of the outer reef by a Gilbertese native in an estimated 25 feet of water. Solitary individuals were often seen in this area, some 2 feet or more in length. They were readily identified underwater by the saddle-like white spot on the posterior part of the body. Some individuals displayed a second white spot below the spinous dorsal fin.

The gut of the Onotoa specimen was empty.

Lutjanus gibbus

Sciaena gibba Forskål 1775. Descr. animalium, pp. xi, 46. (Type locality, Arabia).

1 specimen. 200 mm. 28 specimens. 35 - 60 mm. Onotoa lagoon.

1 specimen. 163 mm. Tarawa.

D X,14; A III,8; P 17; vertical scale rows from upper end of gill opening to base of caudal fin about 65. (2 specimens).

Profile of head of adults concave, the upper part ascending steeply to origin of dorsal fin; lobes of caudal fin rounded. Profile of head of young straight; ends of caudal lobes pointed.

Color from 35 mm Kodachrome transparency of 200 mm specimen: red, the centers of the scales on the body and operculum whitish; spinous portion of dorsal fin red; soft portion of dorsal fin, anal fin, and caudal fin reddish black with narrow white margins; pectoral fins red with a golden spot in region from upper part of base to gill opening at level of opercular spine; pelvic fins reddish; a small golden patch posterior to knob on interopercle; iris yellow except for a narrow red rim around pupil.

Color in life of juveniles 35 to 60 mm in length: blue-green on back, pale below; borders of scales black, resulting in an oblique lined effect on the body due to the ascending scale rows; a large black area on caudal peduncle and base of caudal fin; rest of caudal fin bright yellow; dorsal grayish with a pale margin and a dark submarginal band.

The adult specimen which was retained for the collection was poisoned with rotenone at station VI at Onotoa. The site of this station consisted of a large truncated coral head which reached to within 3 feet of the surface of the lagoon. The juvenile specimens were taken from the *Thalassia* flat region of station V.

The species was observed only in shallow lagoon waters around coral heads. In the northern Marshall Islands, however, Schultz (1953) reports taking it only from moderately deep water.

The stomach contents of three Onotoa specimens, 250 to 290 mm in standard length, were examined. These fishes were collected with the use of rotenone. They had eaten small fishes which were probably prior victims to the poison than the lutianids themselves.

Lutjanus kasmira

Sciaena kasmira Forskål 1775. Descr. animalium, pp. xi, 46. (Type locality, Arabia).

20 specimens. 30 - 120 mm. Onotoa.

2 specimens. 37 and 45 mm. Tarawa.

D X,15; A III,8; P 16; vertical scale rows from upper end of gill opening to base of caudal fin about 65. (2 specimens).

Color from a 35 mm Kodachrome transparency of a 90 mm specimen: yellow dorsally, shading to white ventrally, with four longitudinal light blue bands on head and upper two-thirds of body; fins yellow.

No large adults of the species were taken. Most of the Onotoa specimens were collected from around coral heads in shallow areas of the lagoon.

Lutjanus rivulatus

Diacope rivulata Cuvier and Valenciennes 1828. Hist. nat. poiss., vol. 2, p. 312, pl. 38. (Type locality, Coromandel, Java, Red Sea, and Malabar).

Lutjanus rivulatus Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 202. (Abaiang, Gilbert Islands).

Genus APRION

Aprion Cuvier and Valenciennes 1830. Hist. nat. poiss., vol. 6, p. 543. (Type species, Aprion virescens Cuvier and Valenciennes).

Aprion virescens

Aprion virescens Cuvier and Valenciennes 1830. Hist. nat. poiss., vol. 6, p. 544. (Type locality, Seychelles).

1 specimen (head only). length of head 164 mm. Tarawa.

Genus APHAREUS

Aphareus Cuvier and Valenciennes. 1830. Hist. nat. poiss., vol. 6, p. 485. (Type species, Aphareus caerulescens Cuvier).

Aphareus furcatus

Labrus furcatus Lacépède 1802. Hist. nat. poiss., vol. 3, pp. 429, 477, pl. 21, fig. 1. (Type locality, le grand Océan).

4 specimens. 120 - 235 mm. Onotoa.

D X,11; A III,8; P 15; lateral line scales 76 and 77; gill rakers 26 (the last 5 of the 10 on the upper limb of the arch are tiny rudiments). (2 specimens).

Color in life of a 230 mm specimen: blue-green above, shading to pale blue below, with anterior third of the exposed part of each scale dark brownish gray, giving an overall bluish gray effect to the fish; a broad bright yellow band from tip of chin across mouth to interorbital space, narrowing beyond this point as it extends to origin of dorsal fin (posterior to interorbital space the yellow is suffused with brownish gray on the edges of the scales); dorsal and anal fins orange-yellow; caudal fin yellowish brown basally, shading to brownish red distally; pectoral fins light yellow on upper half, clear reddish brown below; pelvic fins yellow, red medially; iris of eye orange next to pupil, light blue in outer half. The other three specimens were colored similarly except they lacked the bright yellow band medially on the head. The fish with the yellow band is a ripe female.

As has been pointed out by Fowler (1928: 195), specimens of A. furcatus with the yellow frontal band (A. flavivultus Jenkins) do not seem to differ in any other way from those lacking this yellow coloration.

This species was always seen as solitary individuals actively swimming several feet off the bottom in coral-rich areas such as the coralliferous terrace of the outer reef. The stomachs of all four specimens were opened. Two were empty, one contained an unidentified fish, and the last had eaten what appears to be a specimen of Priacanthus.

Genus CAESIO

Caesio Lacépède 1802. Hist. nat. poiss., vol. 3, p. 85. (Type species, Caesio coerulaureus Lacépède).

Caesio coerulaureus

Caesio coerulaureus Lacépède 1802. Hist. nat. poiss., vol. 3, p. 85. (Type locality, Moluccas).

1 specimen. 240 mm. Onotoa.

D X,15; A III,11; P 22; lateral line scales 69; scales from lateral line to base of spinous dorsal fin 7½; gill rakers 41.

A single bony process on premaxillary besides the median process; teeth on premaxillary in one row (one or two tiny teeth were found medial to this row); no palatine or vomerine teeth visible; depth of body 3.7 in standard length.

Color from a 35 mm Kodachrome transparency dark blue dorsally, shading to light blue on side and white ventrally; a greenish yellow longitudinal band from upper edge of gill opening to upper base of caudal fin; median part of lobes of caudal fin broadly black; a triangular black mark on upper half of base of pectoral fin; dorsal fin gray; anal fin reddish; pectoral fin light yellowish; iris pale yellow.

The specimen was speared from a school of about 12 individuals swimming at a depth of about 30 feet on the coralliferous terrace of the outer reef.

Caesio xanthonotus

Caesio xanthonotus Bleeker 1853. Nat. Tijdschr. Ned.-Ind., vol. 4, p. 466. (Type locality, Batavia).

7 specimens. 125 - 185 mm. Onotoa.

D X,15; A III,12; P 21; lateral line scales 59 and 62 (these extend half way out on caudal fin); scales from lateral line to base of spinous portion of dorsal fin 6; gill rakers 34 and 35. (2 specimens).

A single elongate process extending dorsally from side of premaxillary (in addition to median process); two rows of teeth on premaxillary, the outer row short and conical, the inner row minute and villiform; no teeth on palatines; vomer essentially toothless (under high power of a binocular microscope several tiny teeth were found after probing in the palate lining); depth of body 3.6 to 3.7 in standard length; pectoral fin longer than head, 2.9 to 3.1 in standard length.

Color in life: posterior half of body above lateral line, caudal peduncle, and caudal fin bright yellow; lower third of head and body white; rest of head and body between the yellow dorsal and ventral white regions bright blue (blackish in preservative); black on tip of chin, axil of pectoral fin, and base of pectoral fin (broader at upper part of base of fin than lower); dorsal fin gray on basal scaled portion, yellowish distally except for a narrow black margin; anal fin reddish basally, shading to yellow and finally whitish distally; paired fins hyaline; inner part of iris red. After death the brilliance of the sharply defined yellow region on the back changes to dull yellowish green and reddish areas appear on the white ventral region.

This species was commonly seen in aggregations of about 50 or more individuals in mid-water on the coralliferous terrace of the outer reef; sometimes the school was dispersed nearly from the surface to the bottom in about 30 or more feet of water and tended to remain in approximately the same location. The individuals of the school were surprisingly unafraid of an approaching swimmer and could be speared with ease. All seven specimens were taken in this manner.

The stomach contents of two of the specimens was examined. As the elongate gill rakers and the swimming position well off the bottom suggest, these individuals proved to be plankton feeders. The bulk of the food material consisted of pelagic copepods. Other typical planktonic constituents such as mollusk larvae, larval stages of shrimp, and fish eggs were found.

Genus PTEROCAESIO

Pterocaesio Bleeker 1875. Versl. Akad. Amsterdam, ser. 2, vol. 9, p. 153. (Type species, Caesio multiradiatus Steindachner = Caesio tile Cuvier and Valenciennes).

Pterocaesio tile

Caesio tile Cuvier and Valenciennes 1830. Hist. nat. poiss., vol. 6, p. 428. (Type locality, Caroline Archipelago).

1 specimen. 140 mm. 23 specimens. 70 - 90 mm. Onotoa.

D XI or XII, 20 or 21; A III, 13 or 14; P 22 or 23; lateral line scales 79 or 80 (last lateral line scale is nearly half way out on caudal fin); scales from lateral line to base of spinous portion of dorsal fin $6\frac{1}{2}$; gill rakers 35 and 36. (3 specimens).

Two elongate processes on the side of the premaxillary in addition to the median process; teeth on premaxillary in a single row; no teeth on palatines or vomer; depth of body 3.9 in standard length of 140 mm specimen, about 4.6 in the small specimens; length of pectoral fin about 4.5 in standard length.

Color in life of 140 mm specimen: dark blue dorsally (dark by virtue of each scale being rimmed in black) down to a narrow longitudinal black band which extends from the upper part of eye out into upper lobe of caudal fin; below this black band to middle of fish irridescent light blue; lower half of body and head white (this became reddish shortly after the fish was speared); a black longitudinal band in lower lobe of caudal fin medial to lowermost two principal caudal rays (like band in upper lobe except that it does not extend on to body); fins faintly reddish; a triangular black spot at upper base of pectoral fin.

Specimens of about 140 mm in length were observed in loose aggregations in mid-water on the coralliferous terrace of the outer reef. All of the small specimens were obtained over coral heads in the lagoon. During our stay at Onotoa, the young of *C. tile* appeared in the lagoon in great numbers, a phenomenon which I was told occurs once in about every ten years. The Gilbertese hold these small fish in high esteem and employ a special fishing method to catch them (see Randall *in* Banner and Randall, 1952: 52-53).

Genus PENTAPUS

Pentapus Cuvier and Valenciennes 1830. Hist. nat. poiss., vol. 6, p. 258. (Type species, *Pentapus iris* Cuvier and Valenciennes).

Pentapus caninus

Scolopsides caninus Cuvier and Valenciennes 1830. Hist. nat. poiss., vol. 5, p. 266. (Type locality, New Guinea).

Heterognathodon caninus Günther 1874. Jour. Mus. Godeffroy, vol. 2-3, pt. 5-6, p. 32. (Abemama, Gilbert Islands).

Genus SCOLOPSIS

Scolopsis Cuvier 1814. Bull. Soc. Philom. Paris, p. 90. (Type species, Scolopsides kurite Cuvier = Anthias vosmeri Bloch).

Scolopsis cancellatus

Scolopsides cancellatus Cuvier and Valenciennes 1830. Hist. nat. poiss., vol. 5, p. 351. (Type locality, Hawaii, Waigiou, Rawak, New Guinea, Vanicolo, and Ulea).

Scolopsis cancellatus Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 208. (Paanopa = Ocean Island).

Genus GNATHODENTEX

Gnathodentex Bleeker 1873. Versl. Akad. Amsterdam, ser. 2, vol. 7, p. 41. (Type species, Pentapus aurilineatus Bleeker).

Gnathodentex aureolineatus

Sparus aureolineatus Lacépède 1802. Hist. nat. poiss., vol. 4, pp. 42, 132.

Pentapus aurolineatus Günther 1874. Jour. Mus. Godeffroy, vols. 2-3, pts. 5-6, p. 33, pl. 25 B. (Kingsmill Islands).

18 specimens. 53 - 185 mm. Onotoa.

D X,10; A III,9; P 15; lateral line scales 71 and 77. (2 specimens).

A strongly serrate longitudinal ridge on maxillary.

Color in life of a 185 mm specimen: silvery brown with a prominent yellow blotch at base of soft dorsal fin and longitudinal yellow lines of about a scale's width on side of body; fins reddish.

Adults were most commonly observed swimming in groups of about eight or ten close to the bottom on the inshore part of the coralliferous terrace of the outer reef. The young were taken from shallow lagoon and channel areas.

Genus MONOTAXIS

Monotaxis Bennett 1830. Memoir...Sir Stamford Raffles, p. 688. (Type species, Monotaxis indica Bennett = Sciaena grandoculis Forskål).

Monotaxis grandoculis

Sciaena grandoculis Forskål 1775. Descr. animalium, pp. xii, 53. (Type locality, Djedda, Red Sea).

24 specimens. 34 - 169 mm. Onotoa.

D X,10; A III,9; P 14; lateral line scales 47. (3 specimens).

Jaws with canine teeth anteriorly, large truncate molariform teeth posteriorly. Specimens up to 39 mm in standard length show no indication of molariform teeth. The last tooth in the lower jaw of a 40 mm juvenile is slightly enlarged. In a 49 mm specimen this last lower tooth is further enlarged and apically rounded, and teeth in front of this tooth are enlarging. The small specimens display a distinct ridge on the maxillary with about 10 to 12 pointed denticulations along the top as seen in Gnathodentex. In the large specimens of Monotaxis this ridge is flattened and inconspicuous and the denticulations rounded and variously fused.

The color in life is variable, some specimens being more melanistic than others and some displaying broad vertical black bars dorsally on the body which are completely absent in others. The color of a 158 mm specimen from my field notes is as follows: greenish purple dorsally, shading to silvery on the sides and ventrally; a large black area above pectoral fin; interorbital yellowish; snout, lips, and chin blackish; dorsal, anal, and pectoral fins light red; caudal fin light red except proximal half of upper and lower lobes which are yellowish orange; pelvic fins hyaline; axil of pectoral fin black.

A striking color change in the young is apparent from my series of juvenile specimens. Specimens from 32 to 37 mm are pale (light greenish dorsally in life) with two lengthwise dark lines, the first running from slightly above center of eye to upper base of caudal fin, and the second from lower base of pectoral fin to lower base of caudal fin; there is a region of black pigment distally in the dorsal fin between the second and sixth dorsal spines. A 40 mm specimen is light brown with four broad black bars on upper half of body, the second and third of which extend up into dorsal fin; a short vertical blackish line extends ventrally from the middle of the lower edge of the eye. A 39 mm specimen exhibits intermediate coloration.

The juvenile specimens with the two lengthwise dark lines were all collected from around small coral heads in sandy, shallow lagoon and channel areas. Adults were taken from coralline areas of both the lagoon and outer reef. Adults were common on the coralliferous terrace of the outer reef. Individuals several times larger than the largest specimen taken were observed. Most species of reef fishes either seek refuge in holes in the coral or flee a considerable distance when alarmed by an approaching swimmer. Monotaxis, however, usually moves away from an intruder very slowly in the direction of deeper water.

The gut contents of two specimens, 158 and 160 mm in standard length, were examined. These consisted mainly of the crushed shells of small mollusks along with the remains of small sea urchins. Considerable bottom debris was present, as would be expected.

Genus LETHRINUS

Lethrinus Cuvier 1829. Règne animal, ed. 2, vol. 2, p. 184. (Type species, Sparus choerorhynchus Bloch and Schneider).

Lethrinus variegatus

Lethrinus variegatus Cuvier and Valenciennes 1830. Hist. nat. poiss., vol. 6, p. 287. (Type locality, Massuah and Suez).

1 specimen. 345 mm. Onotoa.

1 specimen. 245 mm. Tarawa.

D X,9; A III,8; P 13; lateral line scales 48; scales from lateral line to middle of spinous portion of dorsal fin 4½. (1 specimen).

Snout 1.7 in head length; depth of body 3.4 in standard length; eye 2.7 in head length.

Color from 35 mm Kodachrome transparency of a large adult: light gray, edges of scales rimmed in dark gray (especially dorsally), with a small orange-red spot at upper base of pectoral fin; axil of pectoral fin orange-red; dorsal and anal fins gray; caudal fin brownish gray; pectoral fin rays faintly orangish; iris pale yellow.

The stomachs of two large specimens collected with rotenone were filled with small fishes which had undoubtedly been prior victims of the poison.

The Onotoa specimen retained for the collection was collected at station VII on the lagoon side of the west reef of the atoll.

Lethrinus nebulosus

Sciaena nebulosus Forskål 1775. Descr. animalium, pp. xii, 52. (Type locality, Arabia).

1 specimen. 225 mm. 2 specimens. 95 mm. Onotoa.

D X,9; A III,8; P 13; lateral line scales 48; scales from lateral line to base of middle part of spinous dorsal fin 5 (5½ in small specimens). (3 specimens).

Length of snout 1.8 in head length; depth of body 2.7 in standard length; head 2.9 in standard length; least depth of caudal peduncle 1.5 in snout; eye 2.3 in head length; third anal spine as long as eye (proportional measurements based on 225 mm specimen).

Color in life: light greenish on back; scales narrowly rimmed with dark brown; faint longitudinal stripes of bluish and of orange; a moderately prominent orange longitudinal band at level of pectoral fin; head light greenish yellow with brownish mottlings; dorsal, anal, and caudal rays with dark annulations.

The 225 mm specimen was taken in poison station VII; the two small specimens were seined from the pond-like body of water nearly enclosed in the northern part of the most northern of the two principal islands of the atoll.

Lethrinus rhodopterus

Lethrinus rhodopterus Bleeker 1852. Nat. Tijdschr. Ned.-Ind., vol. 3, p. 65. (Type locality, Singapore).

13 specimens. 50 - 158 mm. Onotoa lagoon.

1 specimen. 112 mm. Tarawa.

D X,9; A III,8; P 13; lateral line scales 47 or 48; scales from lateral line to middle of base of spinous dorsal fin 5. (2 specimens).

Length of snout 2 in head length; depth of body 2.6 in standard length; length of head 3.2 in standard length.

Color in life of a 158 mm specimen which was speared in about 7 feet of water over sand near a lagoon coral head: light gray, each scale center a whitish spot; a large blackish spot just below lateral line, nearly centered on tip of outstretched pectoral; fins reddish, especially the caudal on the posterior half of which there is a broad irregular reddish band which contains pale areas. Immediately upon being speared, the entire posterior half of the fish became dark.

The stomach of the above specimen contained a small, unidentified fish. The stomach contents of 10 specimens from poison station V which measured 75 to 134 mm in standard length were examined. One fish was empty, and the others contained small fishes which were probably eaten following their being killed or nearly so by the rotenone. In addition to fishes one individual had previously eaten an unidentified crustacean.

Lethrinus reticulatus

Lethrinus reticulatus Cuvier and Valenciennes 1830. Hist. nat. poiss., vol. 6, p. 298. (Type locality, New Guinea).

Lethrinus moensii Günther 1874. Jour. Mus. Godeffroy, vols. 2-3, pts. 5-6, p. 64, pl. 46, fig. A. (Kingsmill Islands).

Lethrinus ramak

Sciaena ramak Forskål 1775. Descr. animalium, p. 52. (Type locality, Red Sea).

Lethrinus ramak Kendall and Goldsborough 1911. Mem. Mus. Comp. Zool., vol. 26, p. 289. (Butaritari, Gilbert Islands).

This species may not be distinct from Lethrinus nebulosus Forskål.

Family LEIOGNATHIDAE

Genus GERRES

Gerres Quoy and Gaimard 1824. Voyage autour du monde... "Uranie", Zool., p. 292. (Type species, Gerres vaigiensis Quoy and Gaimard).

Gerres oblongus

Gerres oblongus Cuvier and Valenciennes 1830. Hist. nat. poiss., vol. 6, p. 479. (Type locality, Ceylon).

1 specimen. 243 mm. Onotoa lagoon.

1 specimen. 187 mm. Tarawa.

D IX,10; A III,7; P 16; lateral line scales to base of caudal fin 45 or 46; scales from origin of dorsal fin to lateral line 7; gill rakers 5 or 6-1-7. (2 specimens).

Color in life silvery with 5 or 6 vertical lines of faint orange spots in middle of side of body.

Depth of body contained 2.6 to 2.7 in standard length; eye 3.6 in head length (with mouth not produced).

Gerres argyreus

Cichla argyrea Bloch and Schneider 1801. Systema ichth., p. 344. (Type locality, Tanna Island and Pacific Island).

Gerres kapas Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 225 (Abaiang, Kingsmill Islands).

2 specimens. 97 and 99 mm. Tarawa.

D IX,10; A III,7; P 16; lateral line scales to base of caudal fin 41; scales from origin of dorsal fin to lateral line 4 or 5; gill rakers 5-1-7.

Color in alcohol dusky dorsally shading to light tan on sides and ventrally; margin of spinous dorsal dusky.

Depth of body contained 2.7 to 2.8 times in standard length; eye 2.7 in head length (with mouth not produced).

Family MULLIDAE

The goatfishes are readily distinguished by their elongate bodies and pair of long barbels that originate on the chin. These fishes are bottom-dwellers and are usually found over sandy areas. The barbels are normally directed backward, but when searching for food they are extended anteriorly and downward into the sand and kept in rapid, almost vibratory, motion as the fish swim forward.

The goatfishes were most commonly seen in the lagoon at Onotoa. The Gilbertese give each species a different name, a fact which reflects the value of these fishes as food.

Identification of the Gilbert Island mullids was made with the assistance of Dr. Ernest A. Lachner.

Genus UPENEUS

Upeneus Cuvier and Valenciennes 1829. Hist. nat. poiss., vol. 3, p. 448. (Type species, Mullus vittatus Forskål).

Upeneus arge

Upeneus arge Jordan and Evermann 1903. Bull. U. S. Fish Comm., vol. 22, p. 187. (Type locality, Honolulu).

Upeneus arge Lachner 1954. Proc. U. S. Nat. Mus., vol. 103, p. 518, pl. 14, fig. A.

2 specimens. 235 and 270 mm. Onotoa.

1 specimen. 225 mm. Tarawa.

D VIII-I,9; A I,6; P 14; lateral line scales 40 or 41. (2 specimens).

Color in life: body light greenish dorsally, silvery white on sides and ventrally, with 2 lengthwise orange-yellow lines from back of head to base of caudal fin (uppermost of these two lines begins at level of eye and is broader than the lower one which starts at axil of pectoral); 5 narrow lengthwise orange lines on back above the 2 principal lines which break up into spots in linear series anteriorly on body; head with numerous short irregular orange lines dorsally, a prominent horizontal orange line anterior to eye, and irregular orange-red blotches ventral to eye and on operculum; first dorsal fin with faint orange bands; second dorsal fin with 4 horizontal orange bands; upper lobe of caudal fin with 7 dusky orange to black horizontal bands; lower lobe of caudal fin with 5 such bands.

The two specimens were speared from a small school of about six rapidly-swimming individuals in the lagoon in about 5 feet of water over sand.

The stomach of the largest specimen was opened and found to be empty.

Genus PARUPENEUS

Parupeneus Bleeker 1863. Ned. Tijdschr. Dierk., vol. 1, p. 242. (Type species, Mullus trifasciatus Lacépède).

Parupeneus trifasciatus

Mullus trifasciatus Lacépède 1802. Hist. nat. poiss., vol. 3, pp. 383, 404, pl. 15, fig. 1.

Upeneus multifasciatus Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 228. (Kingsmill Islands).

17 specimens. 53 - 120 mm. Onotoa.

D VIII-9; A 7; P 16; lateral line scales 29. (2 specimens).

Color from a 35 mm Kodachrome transparency white with a vertical black bar extending ventrally from anterior part of second dorsal fin, and another black bar on caudal peduncle; a narrow dusky vertical bar between first and second dorsal fins and a broad dusky vertical bar beneath first dorsal fin; a short blackish band extending posteriorly and slightly dorsally from just below middle of eye; snout, lips, and barbels pink; iris red; first dorsal fin pale pink; remaining fins faintly yellowish.

This is the most omnipresent goatfish at Onotoa.

The stomach contents of three small specimens (54 to 55 mm) were examined. The fish had eaten amphipods, copepods, other small unidentified crustacea, and unidentified eggs. Surprisingly, there was no inorganic sediment present.

Parupeneus barberinus

Mullus barberinus Lacépède 1802. Hist. nat. poiss., vol. 3, pp. 283, 406, pl. 13, fig. 3. (Type locality, near Moluccas).

10 specimens. 59 - 280 mm. Onotoa.

1 specimen. 168 mm. Tarawa.

D VIII-9; A 7; P 17; lateral line scales 30. (2 specimens).

Color from 35 mm Kodachrome transparency of a 280 mm specimen: a black band running from just above upper lip through eye along back to beneath rear base of second dorsal fin; body above this band bright yellow, below white with occasional small yellow spots; a large round black spot on posterior part of caudal peduncle centered slightly above midline; black band on head bordered with blue; a reddish violet patch on opercle; short irregular yellow lines on head below black band; lips and lower part of head orange; dorsal fins pale grayish lavender; caudal fin lavender; anal fin whitish; pectoral fins light dusky yellow; pelvic fins light orange; iris yellow except a narrow ring next to pupil which is orange.

This species was found in sandy areas of both the lagoon and outer reef.

Parupeneus chryserydros

Mullus chryserydros Lacépède 1802. Hist. nat. poiss., vol. 3, pp. 384, 406.

5 specimens. 60 - 130 mm. Onotoa.

D VIII-9; A 7; P 17; lateral line scales 17. (2 specimens).

Color in life of all of the Onotoa specimens entirely bright yellow. E. A. Lachner (MS) is unable to separate this yellow form meristically or otherwise from the usual P. chryserydros and therefore considers it a color phase.

Because of its yellow color, this species was easily spotted underwater. It was seen in both lagoon and outer reef areas; however it was not common.

Parupeneus pleurostigma

Upeneus pleurostigma Bennett 1831. Proc. Zool. Soc. London, vol. 1, p. 59. (Type locality, Mauritius).

Upeneus pleurostigma Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 231. (Abemama, Gilbert Islands).

Genus MULLOIDICHTHYS

Mulloidichthys Whitley 1929. Rec. Australian Mus., vol. 17, p. 122. (Type species, Mullus flaveolineatus Lacépède).

Mulloidichthys samoensis

Mulloides samoensis Günther 1874. Jour. Mus. Godeffroy, vols. 2-3, pts. 5-6, p. 57, pl. 43, fig. B. (Type locality, Apia, Samoa).

8 specimens. 80 - 145 mm. Onotoa.

3 specimens. 90 - 193 mm. Tarawa.

2 specimens. 70 and 71 mm. Nukunau.

D VII-9; A 7; P 17; lateral line scales 37; gill rakers 27 and 28. (2 specimens).

Color in alcohol light brown, the edges of the scales slightly darker, with a blackish spot, about half the size of the eye, on side of body at level of the first dorsal fin just below the lateral line; peritoneum black; a dusky spot on inside of opercle.

All of the Onotoa specimens were obtained from relatively shallow sandy areas of the lagoon. The species is abundant.

Mulloidichthys (auriflamma?)

Mullus auriflamma Forskål 1775. Descr. animalium, pp. 10, 30. (Type locality, Red Sea).

1 specimen. 78 mm. Onotoa.

Color in life: a bright yellow band from eye to upper base of caudal fin, bordered above and below by narrower blue bands; upper blue band ends below posterior part of anal fin; region below lower blue band yellowish, shading to white ventrally; dorsal fins dusky yellow; anal, caudal, and pelvic fins bright yellow; pectoral fins light yellow; no black spot was visible on the side.

This small specimen has been given to Dr. Lachner who is still not certain of the identification. He counted 30 gill rakers.

The specimen was speared in a Thalassia flat area of the lagoon.

Family PEMPHERIDAE

Genus PEMPHERIS

Pempheris Cuvier 1829. Règne animal, ed. 2, vol, 2, p. 195. (Type species, Pempheris touea Cuvier = Sparus? compressus Shaw).

Pempheris oualensis

Pempheris oualensis Cuvier and Valenciennes 1831. Hist. nat. poiss., vol. 7, p. 299. (Type locality, Oualan).

Pempheris mangula Günther 1873. Jour. Mus. Godeffroy, vol. 2, pt. 3, p. 102, pl. 59, fig. B. (Kingsmill Islands).

4 specimens. 115 - 153 mm. Onotoa.

1 specimen. 150 mm. Tarawa.

D VI,9; A III,40 to 43; P 17; lateral line scales 65 or 66; gill rakers 29. (3 specimens).

Color from 35 mm Kodachrome transparency brownish silver; a black spot at base of pectoral fin; dorsal fin yellowish brown with anterior edge broadly black; anal fin yellowish brown, black anteriorly and at base; caudal fin base and upper and lower lobes dark brown, rest of fin yellowish brown.

This species was taken in surge channels and outer reef terrace near the entrance to surge channels. It is very secretive, being seen only in recesses in the reef during the day. I suspect that it may be a nocturnal fish. The large eye supports this contention.

Family POMACENTRIDAE

The damsel fishes are usually small and often vividly colored. As a group they are characterized chiefly by having a single nostril on each side of the snout. They were well represented at Onotoa, both in number of species and abundance of individuals. Most species exhibit distinctive habitat preferences; they usually take cover in interstices in coral or holes in the reef (or, in the well-known case of Amphiprion, in sea anenomes) upon approaching danger. The Gilbertese general name for pomacentrids is te reibu.

Key to the Species of Pomacentridae Recorded from the Gilbert Islands

1a. Dorsal spines X or XI; scales small, about 50 scale rows from upper edge of gill opening to base of caudal fin; body with 2 or 3 vertical pale bars (light blue in life)..2

1b. Dorsal spines XII or XIII; scales not small, 30 or fewer scale rows from upper edge of gill opening to base of caudal fin; body without 2 or 3 vertical pale bars...3

2a. Body, at least in adults, with 2 vertical pale bars, one on head running from nape behind eye to subopercle and interopercle and the other, noticeably narrower (covering 2 to 4.5 lateral line scales), located in middle of body, and lacking an upper portion extending obliquely backward on unscaled part of the dorsal fin; next to last dorsal spine contained 1.2 to 1.4 times in longest dorsal spine; caudal fin uniformly pale.............................Amphiprion bicinctus

2b. Body (at least in Gilbert Islands specimens) with 3 vertical pale bars, one on the head as in 2a, the second, nearly as broad (covering 6.5 lateral line scales), located in middle of body and extending obliquely backward to outer edge of dorsal fin, and the third on caudal peduncle; next to last dorsal spine contained nearly 3 times in the length of the longest dorsal spine; caudal fin with a large, circular centro-posterior dusky area.......Amphiprion sebae

3a. Teeth in front part of jaws conical, usually well-separated..4

3b. Teeth in front part of jaws not conical, at least somewhat compressed, and usually close-set..............10

4a. Body deep, the greatest depth contained 1.5 to 1.7 times in standard length; suborbital evident externally and serrated; preopercle serrated..............5

4b. Body not deep, the greatest depth contained more than 2 times in standard length; suborbital not evident externally or poorly-defined and lacking serration; preopercle not serrated (except in C. lepidolepis)...6

5a. Body pale with 3 broad vertical black bars; caudal fin forked..............................Dascyllus aruanus

5b. Body dark, without vertical bars, and with a pale spot in middle just above lateral line (more evident in young); caudal fin truncate or slightly emarginate... ....Dascyllus trimaculatus

6a. Each body scale with 1 to 3 small, basal, auxiliary scales; edge of preopercle serrated; region from nostril to upper lip scaled.........Chromis lepidolepis

6b. No basal auxiliary scales present; edge of preopercle smooth; narrow region from nostril to upper lip naked..7

7a. Body more or less uniform brown in color (blue-green in life) without sharply-contrasting markings; second dorsal spine the longest; dorsal and anal soft rays 9 or 10.................................Chromis caeruleus

7b. Body not uniform light brown and with distinctive dark and light contrasting markings; middle dorsal spines the longest; dorsal and anal soft rays 11 or 12......8

8a. Upper and lower lobes of caudal fin dark brown; scales on anterior 1/3 of interorbital space and dorsally on snout very small, about 1/8 the size of those in the mid-interorbital region; basal third of pectoral fin pale (yellow in life), outer portion of fin with rays dusky, membranes clear........Chromis xanthochir

8b. Upper and lower lobes of caudal fin pale like rest of fin or very slightly dusky; scales on anterior 1/3 of interorbital space and dorsally on snout not markedly smaller than more posterior scales; basal third of pectoral fin not paler than remainder of fin.........9

9a. Posterior part of body abruptly pale (white in life and in sharp contrast to remainder of body which is dark brown) in a vertical demarcation at the level of base of 7th dorsal soft ray; a large round black spot at base of pectoral fin; preopercular aperture not margined with dark brown; gill opening without a dark brown edge; pectoral rays 16 or 17...Chromis dimidiatus

9b. Posterior part of body paler than rest of body (with sharp contrast only in large adults) at a level posterior to base of last dorsal and anal rays; a narrow curved black or dark brown line at the base of the pectoral fin; preopercular aperture margined with dark brown; gill opening (especially dorsally in small specimens) edged in dark brown; pectoral rays 18 or 19......................Chromis opercularis

10a. Margin of preopercle smooth; suborbital smooth........11

10b. Margin of preopercle serrated; suborbital usually serrated...23

11a. 5 or 6 vertical dark bars on body; dorsal spines XIII; size often greater than 130 mm in standard length (except Abudefduf curacao which probably does not exceed 100 mm).......................................12

11b. 5 or 6 vertical dark bars not present on body; dorsal spines XII or XIII; size rarely exceeding 80 mm in standard length......................................15

12a. Dorsal soft rays 15 or 16; anal soft rays 14 or 15; a black saddle dorsally on caudal peduncle in adults....................................Abudefduf sordidus

12b. Dorsal soft rays 12 or 13; no black saddle dorsally on caudal peduncle in adults (upper part of caudal peduncle bar no darker than lower part).............13

13a. 6 vertical dark bars on body; forehead scaled to least interorbital space; caudal fin moderately forked, horizontal distance from ends of middle caudal fin rays to tips of upper rays contained more than 2 times in head length........Abudefduf septemfasciatus

13b. 5 vertical dark bars on body; forehead scaled to nostrils; caudal fin deeply forked, horizontal distance from ends of middle caudal fin rays to tips of upper rays contained less than 2 times in head length.....14

14a. Preorbital naked; body depth contained 1.65 to 1.8 times in standard length; vertical scale rows 26 to 28.................................Abudefduf saxatilis

14b. Preorbital scaled; body depth contained 1.75 to 1.9 in standard length; vertical scale rows 24 or 25.......................................Abudefduf curacao

15a. Dorsal fin rays XII, 15 to 18; anal soft rays 13 to 15..16

15b. Dorsal fin rays XIII, 12 or 13; anal soft rays 12 or 13..19

16a. Body and fins yellowish white with no distinctive pigmented markings (except anterior 2/3 of eye which is blackish)....................Abudefduf imparipennis

16b. Body brown or dark brown with distinctive pigmented markings..17

17a. 4 vertical pale (pink in life) bars on body (a 5th is present at base of caudal fin but is not readily visible due to caudal being pale); a broad black bar on caudal peduncle..............Abudefduf phoenixensis

17b. No vertical pale bars on body; caudal peduncle paler than rest of body and without a black bar...........18

18a. Body light brown with a broad vertical black bar on side at level of 2nd to 6th dorsal soft rays; no spots on body; dorsal soft rays 17 or 18...Abudefduf dicki

18b. Body very dark brown with no vertical black bar; small, pale (blue in life) spots widely scattered on body; dorsal soft rays 15 to 17 (usually 15 or 16)...Abudefduf lacrymatus

19a. A round black spot at upper edge of base of caudal fin; a bluish (bright blue in life) line passing from snout through upper edge of eye and widening to a band along back adjacent to spinous dorsal fin; a large black spot at base of last 2 dorsal spines.................................Abudefduf leucopomus

19b. No black spot at upper edge of base of caudal fin; no blue line from snout through eye to base of spinous dorsal (except young of A. glaucus and possibly also biocellatus); a black spot may or may not be present at base of last two dorsal spines......................20

20a. Body light brown or gray (bluish gray in life); margin of anus black and contrasting with light color of body................................Abudefduf glaucus

20b. Body brown or dark brown; anus not black (if dark, not contrasting with rest of body)........................21

21a. A large white elliptical spot on operculum; basal 1/3 of caudal fin black and contrasting with caudal peduncle and outer part of caudal fin which are pale; a vertical pale bar usually present in middle of body; dorsal and anal soft rays 12....Abudefduf amabilis

21b. No white spot on operculum; basal 1/3 of caudal fin not black; a vertical pale bar may or may not be present on side of body; dorsal and anal soft rays 13 (rarely 12)..22

22a. A black spot at base of last 2 dorsal spines; a second, smaller, black spot at base of last 2 or 3 dorsal soft rays; a vertical pale bar usually not present on side of body..................Abudefduf biocellatus

22b. No black spot at base of last 2 dorsal spines; no black spot at base of last few dorsal soft rays; a vertical pale bar usually present on side of body...Abudefduf zonatus

23a. Dorsal spines XII; one row of teeth in each jaw.......24

23b. Dorsal spines XIII; two rows of teeth in each jaw, the inner closely applied to the outer (each inner tooth shorter and narrower with tip in interspace between 2 outer teeth)..28

24a. Preorbital large, its width measured from eye toward rictus about equal to eye diameter; no black spot at base of last few dorsal rays or dorsally on caudal peduncle; no dark brown or black spot at upper base of pectoral fin.......................Pomacentrus lividus

24b. Preorbital not large, its width measured from eye toward rictus contained about 2 times in diameter of eye; a black spot at base of last few dorsal rays or dorsally on caudal peduncle; a dark brown or black spot at upper base of pectoral fin...........................25

25a. A black spot mid-dorsally on caudal peduncle, not touching dorsal fin rays; rest of body and fins pale (bright yellow in life) except for a small black spot at extreme upper edge of pectoral fin and black anus.......................Pomacentrus aureus

25b. No black spot mid-dorsally on caudal peduncle (a spot, if present, at base of last few dorsal rays and extending only narrowly on caudal peduncle); body and fins brown to dark brown (except pale phase of nigricans, in which case, anus not black)...........26

26a. Anal soft rays 12; dorsal soft rays 14 or 15; lobes of caudal fin pointed; snout scaled to level of nostrils.......................Pomacentrus albofasciatus

26b. Anal soft rays 12 to 14 (rarely 12); dorsal soft rays 15 to 17; lobes of caudal fin pointed or rounded: snout scaled slightly beyond level of nostrils......28

27a. Black spot at axil of soft dorsal fin preceded by a prominent pale area; anal soft rays 12 or 13 (rarely 13); pectoral rays 20 to 21 (usually 20); lobes of caudal fin pointed.............Pomacentrus eclipticus

27b. Black spot at axil of soft dorsal fin not preceded by a pale area; anal soft rays 13 or 14; pectoral rays 18 to 20 (rarely 20); lobes of caudal fin rounded..................................Pomacentrus nigricans

28a. Body slim, depth contained 2.5 to 2.8 in standard length; dorsal soft rays 13 or 14...................29

28b. Body not slim, depth contained 1.8 to 2.1 in standard length; dorsal soft rays 14 to 17 (rarely 14).......30

29a. Anal soft rays 13 (rarely 14); body light brown (blue in life), only slightly darker dorsally than ventrally; a prominent black spot on opercle, as large or larger than pupil; depth of body 2.5 to 2.6 in standard length...............................Pomacentrus pavo

29b. Anal soft rays 15; body very dark brown (bright blue in life) except caudal peduncle and ventrally near anal fin which is abruptly pale (bright yellow in life); a small black spot on opercle, smaller than pupil (difficult to see because of dark color of body); depth of body 2.6 to 2.8 in standard length.....................................Pomacentrus coelistis

30a. A large black ocellated spot at base of 7th to 11th dorsal soft rays; body light brown (blue in life) with small dark brown spots on scales forming dotted lines on head and body; a hook-like ventral projection anteriorly on suborbital; anal soft rays 15 or 16; pectoral rays 17 or 18.............Pomacentrus vaiuli

30b. No large black ocellated spot in soft dorsal fin; body dark brown with lower half of each scale margin still darker, resulting in near-vertical lines on body; no hook-like projection on suborbital; anal soft rays 12 to 14; pectoral rays 20 or 21..Pomacentrus jenkinsi

Genus AMPHIPRION

Amphiprion Block and Schneider 1801. Systema ichth., p. 200. (Type species, Lutjanus ephippium Bloch).

Amphiprion bicinctus

Amphiprion bicinctus Rüppell 1828. Atlas Reise nörd. Afrika, Fische des Rothen Meeres, p. 139, pl. 35, fig. 1. (Type locality, Red Sea).

2 specimens. 76 and 85 mm. Onotoa.

1 specimen. 67 mm. Butaritari.

Color from 35 mm Kodachrome transparency: body dark brown, orange-yellow ventrally on chest and abdomen; head anterior to eye and all fins orange-yellow; a broad, near-vertical, light blue, dark-edged band running from nape on to posterior part of the head behind eye to subopercle and interopercle; a similar but narrower vertical band from base of last 2 dorsal spines almost to anus; all fins except pectoral very narrowly margined with black.

Considerable difference was seen in the two Onotoa specimens. In one the second vertical bar is very narrow, only 2 lateral line scales in width, and, except at the ends, of about uniform width; the caudal peduncle is dark brown; the soft dorsal rays number 15; the preopercular margin is serrate. In the other the second vertical bar is broader (4 lateral line scales in width) and narrower ventrally; the caudal peduncle is largely pale, especially ventrally; the dorsal soft rays number 17; the margin of the preopercle is smooth. One would suspect these differences to be of a specific level were it not for the specimen from Butaritari which is intermediate in all of these characters except the second pale blue vertical bar which is 4½ lateral line scales in width and gradually narrows as it proceeds ventrally.

The largest specimen was speared in from 35 to 40 feet of water on the outer sea reef bench just as it was entering a large sea anenome. The other Onotoa specimen was brought in by a Gilbertese boy with no data as to locality. The specimen from Butaritari was speared in quiet water of about 9 feet in depth on the sea reef on the lee side of the atoll.

Amphiprion sebae

Amphiprion sebae Bleeker 1853. Nat. Tijdschr. Ned.-Indië, vol. 4, p. 478; 1877, Atlas ichth., vol. 9, pl. 400, fig. 9. (Type locality, Batavia, Java).

1 specimen. 51 mm. Onotoa.

Color in life dark yellow-brown shading to yellow-orange on head anterior to eye and ventrally on chest and abdomen; body with 3 vertical light purplish-blue bars edged in black (the first extending from nape to operculum as in *A. bicinctus*; the second, 6½ lateral line scales in width and narrower ventrally, in middle of body and on dorsal fin from 9th dorsal spine to first dorsal soft ray; the third reaching 2/3 the way down on caudal peduncle); caudal fin yellow-orange with a large round dusky patch in centro-posterior part of fin; dorsal fin yellow-orange except posterior part of soft dorsal which is dusky orange; pectoral, pelvic, and anal fins yellow-orange; all fins except pectoral with a very narrow black margin.

The specimen was secured with rotenone in the Onotoa lagoon in a sandy region with occasional patches of coral rubble at a depth of 5 feet. Before being poisoned it was observed to be in close association with a sea anenome of about 5 inches in diameter (when expanded).

There is a specimen of this species in the Bishop Museum, Honolulu, bearing the label, Apiang, Gilbert Islands.

Genus DASCYLLUS

Dascyllus Cuvier 1829. Règne animal, vol. 2, p. 179. (Type species, Chaetodon aruanus Linnaeus).

Dascyllus aruanus

Chaetodon aruanus Linnaeus 1758. Syst. nat., ed. 10, p. 275. (Type locality, Indies).

23 specimens. 10 - 45 mm. Onotoa.

2 specimens. 38 and 46 mm. Tarawa.

Color in life white with 3 broad near-vertical black bars, one running from nape through eye to chin, the second from region of 5th to just beyond 8th dorsal spines passing downward under pectoral fin, and the third from base of 12th dorsal spine and remainder of dorsal fin (except distal ends of last few soft dorsal rays) vertically downward to anal fin (the last 2 bars interconnect distally in the spinous dorsal fin); pectoral and caudal fins white; pelvic and anal fins (except extreme tips of last anal rays) black.

All of the Onotoa specimens were obtained from coral areas of the lagoon. Many were collected merely by breaking off small coral heads, removing the coral from water, and picking the little fish out with forceps.

Dascyllus trimaculatus

Pomacentrus trimaculatus Rüppell 1828. Atlas Reise im nörd. Afrika, Fische des Rothen Meeres, p. 39, pl. 88, fig. 3. (Type locality, Massaua, Red Sea).

1 specimen. 106 mm. Onotoa.

Color in life dark purplish brown becoming orangish in extreme ventral region, with centers of scales whitish; a white spot on side just above lateral line at the level of the 8th dorsal spine, this spot fading upon death of the specimen; spinous portion of dorsal fin purplish brown with a row of yellow spots, one per interradial membrane; basal half of soft dorsal fin purplish brown, outer half with membranes clear, rays brown; anal, pelvic, and caudal fins dusky orange, narrowly dark brown at margins; pectoral fin hyaline.

The single specimen seen was speared on the coralliferous terrace of the outer reef at an estimated depth of 35 feet.

Genus CHROMIS

Chromis Cuvier 1815. Mém. Mus. Hist. Nat. Paris, vol. 1, p. 393. (Type species, Sparus chromis Linnaeus).

Chromis lepidolepis

Chromis lepidolepis Bleeker 1877. Versl. Akad. Amsterdam, vol. 10, p. 389;--Atlas ichth., vol. 9, pl. 403, fig. 2. (Type locality, Timor, East Indies).

Dascyllus pomacentroides Kendall and Goldsborough 1911. Mem. Mus. Comp. Zoöl., vol. 26, p. 298, pl. 5, fig. 1. (Butaritari).

2 specimens. 41 and 44 mm. Onotoa.

Color after 3 days in formalin: dark brown dorsally, lighter brown on sides and ventrally; scales with narrow dark brown margins; dorsal and anal fins dark brown, pale posteriorly; a very dark brown lengthwise band in each lobe of caudal fin.

The 2 specimens were obtained in the Onotoa lagoon very close to the west reef in an area containing numerous coral heads.

Chromis caeruleus

Heliases caeruleus Cuvier and Valenciennes 1830. Hist. nat. poiss., vol. 5, p. 497. (Type locality, New Guinea and Ulea).

Heliastes lepidurus Günther 1881. Jour. Mus. Godeffroy, vol. 7, pt. 15, p. 238, pl. 128, figs. C & D. (Kingsmill Islands).

Chromis caeruleus Kendall and Goldsborough 1911. Mem. Mus. Comp. Zoöl., vol. 26, p. 299. (Butaritari).

12 specimens. 27 - 64 mm. Onotoa.

3 specimens. 32 - 57 mm. Tarawa.

Color from 35 mm Kodachrome transparency: dorsal half of body light blue-green, shading to white on ventral half; dorsal and anal fins bluish; baso-central portion of caudal fin blue-green, grading to dark blue on upper and lower lobes; posterior third of caudal fin pale.

All Onotoa specimens were obtained in the lagoon where they were always seen close to coral heads in which they sought refuge.

Chromis xanthochir

Heliases xanthochir Bleeker 1851. Nat. Tijdschr. Ned.-Indië, vol. 2, p. 248;--1877, Atlas ichth., vol. 9, pl. 402, fig. 5. (Type locality, Banda Islands).

Pomacentrus anabatoides Bean and Weed (not of Bleeker) 1912. Proc. U.S. Nat. Mus., vol. 42, p. 608.

Chromis weberi Fowler and Bean 1928. Bull. U.S. Nat. Mus. 100, vol. 7, p. 41, pl. 1.

Chromis reticulatus Fowler and Bean 1928. Bull. U. S. Nat. Mus. 100, vol. 7, p. 40.

Chromis scotochilopterus Fowler 1918. Proc. Acad. Nat. Sci. Phila., vol. 70, p. 61, fig. 24.

1 specimen. 65 mm. Onotoa.

Color in life dark brown dorsally, grading to dark olive green on sides; spinous dorsal dusky yellow with large brown blotches posteriorly on basal 2/3 of fin membranes, leaving a narrow band of yellow anterior to brown region on each interspinous membrane; soft dorsal and anal fins dark brown with dusky yellow on posterior portion, especially on soft dorsal where the upper posterior half of the fin is dusky yellow; pectoral fin dusky with a large dark yellow spot basally on rays; outer edges of the upper and lower lobes of the widely-forked caudal fin dark brown, medial portions and central part of caudal fin clear; pelvic fins dusky.

The single specimen taken was speared from a small school of this species seen in a poorly-defined surge channel on the lee side of the most northern island of the atoll in about 5 feet of water. All of the fish in the aggregation were of about the same size.

The type of C. reticulatus Fowler and Bean from Bouro Island was examined. The dark edges of the scales are not a unique feature, for they appear in Bleeker's plate of C. xanthochir and were seen in some of the types of C. weberi The Onotoa specimen is very melanistic, but the dark edges to the scales are visible in it as well. Although the type of C. scotochilopterus was not seen, specimens from the Albatrose collections in the U. S. National Museum which were identified by Fowler as scotochilopterus appear to be C. xanthochir. C. ternatensis (Bleeker) is distinct on the basis of 12 dorsal spines and a deeper body.

Chromis dimidiatus

Heliastes dimidiatus Klunzinger 1871. Verk. zool. bot. Ges. Wien, vol. 21, p. 529. (Type locality, Red Sea).

Chromis leucurus Gilbert 1905. Bull. U. S. Fish Comm. 23, pt. 2, p. 620, pl. 77, fig. 2.

22 specimens. 36 - 50 mm. Onotoa.

Color in life dark chocolate brown with portion of body and fins posterior to a vertical level at base of the 7th soft dorsal ray abruptly white; a large round black spot at base of pectoral fin.

With the exception of C. caeruleus, this species of Chromis was the most abundant at Onotoa. All specimens were secured with rotenone on either the lagoon or sea side of the west or lee reef of the atoll.

Males of the species have larger teeth than the females.

In Hawaii C. leucurus Gilbert has been considered distinct by some authors. The demarcation between the anterior dark and posterior pale parts of the body occurs just behind the base of the last dorsal and anal rays; and the body color in general is lighter (though variable). Counts of the soft dorsal rays are 13 and those of the anal usually 13; pectoral rays are 17 or 18. The distinction, therefore, is very minor, and the species in Hawaii should perhaps be considered only a variety or subspecies of dimidiatus. C. iomelas Jordan and Seale from Samoa may, however, be a valid species with the division of the dark and light parts of the body occurring at the level of the 6th or 7th dorsal spines and the fin ray counts, as given by Jordan and Seale, being 11 for the soft dorsal and 12 for the anal fins.

Chromis opercularis

Heliastes opercularis Günther in Playfair and Günther 1866. Fishes of Zanzibar, p. 84, pl. 11, fig. 2.

5 specimens. 45 - 88 mm. Onotoa.

Color in life brown, with edges of scales slightly darker than centers; a vertical, very dark brown line at preopercular aperture; another line, equally broad and dark, running from upper edge of gill opening to dorsal edge of base of pectoral fin and continuous with dark axil of pectoral fin and a curved dark line at the lateral base of the fin; dorsal and anal fins dark brown except posterior rays which are abruptly pale; caudal peduncle and caudal fin paler than rest of body. The caudal region is markedly and abruptly pale in the three large specimens (over 77 mm long) and suggestive of C. dimidiatus coloration.

All of the specimens of the species were taken in one locality at Onotoa, the lagoon side of the west reef in an estimated 10 feet of water.

The Onotoa specimens differ from Günther's figure and description in lacking any dark spot on the caudal fin rays. C. opercularis is very closely related to C. xanthurus Bleeker which apparently lacks the dark lines on the edge of the preopercle and opercle.

Genus ABUDEFDUF

Abu-defduf Forskål 1775. Descr. animalium, p. 59. (Type species, Chaetodon sordidus Forskål).

Abudefduf sordidus

Chaetodon sordidus Forskål 1775. Descr. animalium, p. 62. (Type locality, Djedda, Red Sea).

2 specimens. 130 and 140 mm. Onotoa.

Color from 35 mm Kodachrome transparency light brownish gray with 6 vertical blackish brown bars on body, the first just posterior to head and the last on caudal peduncle; centers of scales paler than edges; upper part of vertical bar on caudal peduncle black; fins dusky, the basal half of caudal, soft dorsal, and anal fins darker than outer half; eye bluish.

The two specimens of Abudefduf sordidus were collected from a surge channel on the outer reef, one with the use of rotenone and the other by a Gilbertese man who caught it with hook and line using hermit crab for bait.

The stomach contents of one adult specimen consisted primarily of green algae.

Abudefduf septemfasciatus

Glyphisodon septemfasciatus Cuvier and Valenciennes 1830. Hist. nat. poiss., vol. 5, p. 463. (Type locality, Mauritius).

Abudefduf septemfasciatus Kendall and Goldsborough 1911. Mem. Mus. Comp. Zool. vol. 26, p. 295. (Butaritari).

3 specimens. 120 - 134 mm. 2 specimens. 15 and 17 mm. Onotoa.

1 specimen. 132 mm. Tarawa.

Color in life of adult specimens dusky white with a faint yellowish cast; 6 vertical brownish bars on body similar to those of sordidus, but no spot on dorsal part of caudal peduncle (the upper part of the third and fourth vertical bars is a little darker, however, appearing as indistinct dark spots); median fins dusky, light yellowish brown distally except ends of caudal lobes which are faintly blackish; pectoral rays light dusky yellow. The juvenile specimens have a jet black saddle dorsally on the caudal peduncle and a large black spot in the front part of the dorsal fin.

The 15 and 17 mm specimens were taken from an inshore tide pool on the outer reef flat. One adult was collected from a surge channel, another from a Heliopora flat in a shallow channel, and the last was seined by Gilbertese from the back ridge trough.

The stomach contents of two adult specimens from Onotoa were examined. They were entirely algal, primarily the fine coralline red, Jania.

Abudefduf saxatilis

Chaetodon saxatilis Linnaeus 1758. Syst. nat., ed. 10, p. 276. (Type locality, India).

2 specimens. 102 and 110 mm. Onotoa.

Color in life blue-green with 5 vertical bluish black bars on the body, the first from origin of dorsal to axil of pectoral fin, the fourth from posterior part of dorsal fin almost to posterior part of anal fin, and the last, a narrower bar, at end of caudal peduncle; all fins except pectoral blackish; pectoral hyaline, rays slightly dusky.

Abudefduf saxatilis was seen in only one location at Onotoa, the coralliferous terrace of the outer reef usually near the entrance to surge channels. It was not abundant. The two specimens were speared with difficulty due to wariness of individual fish.

The closely-related *A. abdominalis* of the Hawaiian Islands invades many habitats and is much more common. It differs from *saxatilis* in having 13 or 14 dorsal and anal soft rays, the fourth dark bar on the body originating at the base of the first few dorsal soft rays (instead of last few), and in developing in adults a large blackish spot basally at the posterior part of the dorsal and anal fins (and concommitant loss of the fifth vertical black bar).

Another similar species is *A. sexfasciatus*. Although not seen in the Gilbert Islands, I would expect it to occur there. This species can be distinguished by the dark upper and lower lobes of the caudal fin and 29 vertical scale rows.

Abudefduf curacao

Chaetodon curacao Bloch 1787. Natur. ausländ. Fische, pt. 3, p. 106, pl. 212, fig. 1. (Type locality, Curacao Island, off Venezuela, possibly an error).

Abudefduf curacao Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 318, fig. 55. (Kingsmill Islands).

Abudefduf imparipennis

Glyphisodon imparipennis Vaillant and Sauvage 1875. Rev. Mag. Zool., ser. 3, vol. 3, p. 279. (Type locality, Honolulu).

Although no specimens of this species were collected, it was commonly seen in the shallow water of the outer part of the seaward reef flat. It was never observed in tidepools.

Abudefduf phoenixensis

Abudefduf phoenixensis Schultz 1943. Bull. U. S. Nat. Mus. 180, p. 190, fig. 15. (Type locality, Enderbury Island, Phoenix Islands).

?*Abudefduf xanthozona* Fowler (not of Bleeker) 1928. Mem. B. P. Bishop Mus., vol. 10, p. 325 (Kingsmills).

2 specimens. 45 and 50 mm. Onotoa.

Color in alcohol brown with 5 vertical pale bars on body and caudal peduncle (these bars recalled as pinkish in life), the first running from nape on to opercle, the second originating at base of 5th dorsal spine, the third at base of last dorsal spine and first dorsal soft ray (the second and third bars extend a short distance into dorsal fin, paralleling direction of fin rays), the fourth and fifth adjacent to a broad vertical black bar on caudal peduncle; base and axil of pectoral fin dark brown; dorsal and anal fins dark brown; an indistinct blackish spot at upper, posterior part of soft dorsal fin; caudal fin pale yellowish; pectoral fin hyaline; pelvics blackish.

A. phoenixensis appears to be restricted to the outer reef flat near surge channels. It was only occasionally seen.

Abudefduf dicki

Glyphisodon dickii Liénard 1839. Dixième Rapp. Soc. Hist. Nat. Maurice, p. 35. (Type locality, Mauritius).

6 specimens. 28 - 60 mm. Onotoa.

This species is readily distinguished by its color pattern. There is a black vertical bar on the body at the level of the 2nd to 6th dorsal soft rays. Anterior to this bar the head and body is cinnamon brown, the body scales with outer edges dark brown; posterior to the bar the body and caudal fin is whitish.

The species was taken on both the lagoon and sea side of the west or lee reef of the atoll.

Abudefduf lacrymatus

Glyphisodon lacrymatus Quoy and Gaimard 1824. Voyage autour du monde..."Uranie"...Zool., p. 388, pl. 62, fig. 7. (Type locality, Guam).

11 specimens. 23 - 63 mm. Onotoa.

1 specimen. 64 mm. Butaritari.

Color in life dark brown with small, widely-scattered, pale blue spots on upper two-thirds of body, head, and dorsal fin; posterior part of dorsal and anal fins, caudal peduncle, and caudal fin pale yellowish.

A. lacrymatus was taken in the same coral-rich areas as A. dicki.

Quoy and Gaimard's figure is of a juvenile specimen in which the pale blue spots occur ventrally and posteriorly on the body and are of relatively larger size than on adults.

A West Indian pomacentrid, Microspathodon chrysyrus (Cuvier and Valenciennes), has a similar sequence of color pattern in life. The young are brown with bright blue spots; with age the spots are reduced and a yellow tail develops.

Abudefduf leucopomus

Glyphisodon leucopomus Lesson 1830. Voyage autour du monde... "Coquille",...Zool., p. 189. (Type locality, Oualan).

2 specimens. 38 and 48 mm. Onotoa.

The salient color character in life is the broad blue band at the base of the spinous dorsal fin which narrows as it extends forward through upper edge of eye and circles snout. There is a prominent black spot enclosed within the posterior part of the blue band; another diagnostic mark is the black spot at the upper edge of the base of the caudal fin; there are faint yellow longitudinal lines on the body and about 14 irregular rows of obscure pale blue spots; all fins slightly yellowish.

The two specimens were secured with rotenone in a well-protected area with numerous small coral heads at the extreme northern part of the atoll.

Abudefduf glaucus

Glyphisodon glaucus Cuvier and Valenciennes 1830. Hist. nat. poiss., vol. 5, p. 475. (Type locality, Guam).

2 specimens. 28 and 43 mm. Onotoa.

1 specimen. 71 mm. Tarawa.

Color in life of 43 mm specimen bluish gray, paler ventrally; back with small blue spots and narrow short lines; a narrow blue line through upper part of eye; median fins pale yellowish with faint narrow black margin; pectoral fins hyaline; pelvic fins dusky yellow. In smaller specimens the blue line through the eye is relatively broader and extends to tip of snout.

Abudefduf glaucus is a very common species of the outer reef flat. Younger specimens were frequently observed isolated in shallow tide pools at low tide; adults tended to stay farther out on the reef flat.

Abudefduf amabilis

Glyphisodon amabilis De Vis 1884. Proc. Linn. Soc. N. S. Wales, vol. 8, p. 452. (Type locality, South Seas islands).

8 specimens. 29 - 53 mm. Onotoa.

2 specimens. 37 and 48 mm. Tarawa.

Color in alcohol chestnut brown, centers of scales whitish; an elliptical white spot vertically aligned on opercle; extreme edge of opercle with a short dark brown band; a large black spot on basal third of caudal fin, contrasting with rest of caudal fin and with caudal peduncle which are pale; a vertical white bar, which angles slightly backward as it passes ventrally, may be present on middle of body (in 4 of 18 Onotoa specimens of the field collection this bar was absent or indistinct); dorsal, anal, and pelvic fins blackish, pectoral fin hyaline, base dark brown.

A common species on the seaward reef flat in the outer rough zone near the surge channels.

Abudefduf biocellatus

Glyphisodon biocellatus Quoy and Gaimard. 1824. Voyage autour du monde..."Uranie"....Zool., p. 389. (Type locality, Guam).

Glyphisodon biocellutus Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 298. (Nauru).

3 specimens. 34 - 62 mm. Onotoa.

5 specimens. 34 - 70 mm. Tarawa.

Color in alcohol brown with 2 lightly-ocellated black spots at base of dorsal fin, one at base of last 2 dorsal spines and the other at axil of soft dorsal; a broad whitish vertical bar may be present on middle of body; caudal fin pale yellowish; dorsal fin pale to dusky with a narrow blackish margin; anal and pelvic fins dusky; pectoral fins pale.

See further discussion of this species under zonatus below.

Abudefduf zonatus

Glyphisodon zonatus Cuvier and Valenciennes. 1830. Hist. nat. poiss., vol. 5, p. 483. (Type locality, New Guinea and Vanicolo Island).

4 specimens. 65 - 70 mm. Onotoa.

Color similar to biocellatus though darker and without the two black spots (at least in adults).

Herre (1936) and others have regarded biocellatus and zonatus as varieties of the same species. Schultz (1943) could not find intergradation of color pattern and considered the two as separate species. I am unable to separate them on any other basis than color, although I have too few specimens for a detailed study of meristic data. A large number of gill raker counts might show a difference. Total gill raker counts (including rudiments) of three *biocellatus* were 23, 23, and 24; of three *zonatus* 23, 25, 25.

I prefer to regard the two as distinct species because of their different habitats as observed at Onotoa. *A. zonatus* was always seen in relatively shallow, somewhat turbid water of the eastern shore of the lagoon where the bottom was sandy with intermittent piles of coral rubble. *A. biocellatus* was taken only in outer reef areas where living coral was abundant.

Genus POMACENTRUS

Pomacentrus Lacépède 1802. Hist. nat. poiss., vol. 4, p. 505. (Type species, *Chaetodon pavo* Bloch).

Pomacentrus lividus

Chaetodon lividus (Forster) Bloch and Schneider 1801. Systema ichth., p. 235. (Type locality, Pacific Ocean).

Eupomacentrus lividus Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 298. (Nauru).

Pomacentrus aureus

Pomacentrus aureus Fowler 1927. Bull. B. P. Bishop Mus. 38, p. 22, fig. 3. (Type locality, Howland Island).

2 specimens. 67 and 70 mm. Onotoa.

Color in life bright yellow with a small black saddle dorsally on caudal peduncle, a small black spot at upper base of pectoral fin, a black anus, and slightly blackish lips. One of the two specimens in preservative has brownish outer edges on the body scales.

This species was rare at Onotoa; it was seen on only two occasions. One specimen was speared in about 20 feet of water on the coralliferous terrace of the outer reef and the other in 4 feet on the lagoon side of the west reef.

Pomacentrus albofasciatus

Pomacentrus albofasciatus Schlegel and Müller 1839-44. Verh. Nat. Gesch. Zool. Leiden, vol. 2, p. 21. (Type locality, Celebes).

Pomacentrus albofasciatus albofasciatus Schultz 1943. Bull. U. S. Nat. Mus. 180, p. 185.

1 specimen. 63 mm. Onotoa.

Color in life dark brownish gray with a broad vertical gray and white bar (gray anteriorly, white posteriorly) in middle of body; a longitudinal gray band running from snout to the gray and white bar.

The single specimen collected was speared by D. W. Strasburg in a Heliopora flat of a channel of about 3 foot depth. He provided the above color note. All of the gray and white coloration disappeared when the fish was speared. Some examples of the species seen underwater lacked the white part of the vertical bar; most did not show the longitudinal gray band.

Pomacentrus eclipticus

Pomacentrus eclipticus Jordan and Seale 1906. Bull. U. S. Bur. Fish., vol. 25, p. 282, fig. 50. (Type locality, Apia, Samoa).

Pomacentrus albofasciatus eclipticus Schultz 1943. Bull. U. S. Nat. Mus. 180, p. 185.

10 specimens. 30 - 54 mm. Onotoa.

Color in alcohol brown with a black spot at base of about last 5 rays of the dorsal fin and narrowly on adjacent portion of caudal peduncle; a pale area, slightly over half the width of the black spot, preceding and adjacent to this spot; a black spot at base of pectoral fin and in axil of pectoral, more intense above; median and pelvic fins dark brown, pectorals hyaline.

Two small specimens (30 mm in standard length) had a black area anteriorly in the dorsal fin which contained a small blue spot. The pale area in front of the black spot in the axil of the soft dorsal was pale blue instead of white, and there was a tiny yellow spot posteriorly within the blue area. There was a faint light blue area behind the black axil spot.

Specimens were seen and taken only from the outer reef, though in two distinctly different areas. One was a broad region at the northern part of the atoll where there was much live coral and fairly quiet water. The other was a rough (both with respect to turbulence of water and nature of substrate) zone on the reef flat just shoreward of the Jania zone and the back ridge trough. It is not uncovered at a low tide.

Pomacentrus nigricans

Holocentrus nigricans Lacépède 1802. Hist. nat. poiss., vol. 4, pp. 332, 367.

48 specimens. 27 - 82 mm. Onotoa.

In life nigricans is usually dark gray to nearly black in color. There is a black spot at the axil of the soft dorsal end one at the upper part of the base of the pectoral fin, but these are difficult to see on dark specimens. The iris is yellowish and there may be small purple dots basally at the front of the anal fin. Occasional specimens had a decided yellowish cast to the body, especially posteriorly and on fins, and in these the black spots are very apparent. There were intermediates connecting the palest specimens with the darkest.

A very abundant species, nigricans was observed in nearly all habitats.

Pomacentrus pavo

Chaetodon pavo Bloch 1787. Natur. ausland. Fische, pt. 3, p. 6, pl. 198. (Type locality, East Indies).

Pomacentrus pavo Kendall and Goldsborough 1911. Mem. Mus. Comp. Zool., vol. 26, p. 295. (Butaritari).

9 specimens. 19 - 65 mm. Onotoa.

1 specimen. 48 mm. Tarawa.

4 specimens. 16 - 25 mm. Abemama.

Color in life blue with vertical paler blue lines on scales; chest and abdomen whitish; outer half of caudal fin pale yellow, the lobes brighter yellow than centro-posterior part of fin; margin and posterior part of anal fin pale yellow; outer portion of last few rays of soft dorsal fin yellow; a dark blue spot at upper edge of opercle (black in preservative); head with small pale blue spots.

Pomacentrus pavo was observed only around coral heads in the lagoon.

Pomacentrus coelestis

Pomacentrus coelistis Jordan and Starks 1901. Proc. Calif. Acad. Sci., zool. ser. 3, vol. 2, p. 383, pl. 21. (Type locality Wakanoura, Kii, Japan).

4 specimens. 43 - 53 mm. Onotoa.

A brilliantly colored species in life, the body was bright blue with caudal peduncle, caudal fin, anal fin and adjacent part of body forward to just before anus, and posterior part of soft dorsal fin bright yellow; pelvic fins yellowish;

pectoral fins hyaline. In preservative a small black spot is apparent on the opercle at the upper edge of the gill opening, the base of the pectoral fin is dark, and the centers of the scales a little paler than edges.

The species was collected in two localities on the lagoon side of the west reef in from 7 to 11 feet of water.

The holotype at the Stanford Natural History Museum was examined and compared with my specimens.

Pomacentrus vaiuli

Pomacentrus vaiuli Jordan and Seale 1906. Bull. U. S. Bur. Fish., vol. 25, p. 280, pl. 40, fig. 2. (Type locality, Samoa).

35 specimens. 16 - 62 mm. Onotoa.

Color in life: light brown on head and nape, shading into blue on body to caudal peduncle; head and body with dark blue spots in linear series; a large black spot in soft dorsal, ringed in light blue; a dark blue spot on opercle, larger than other spots on head, at upper end of gill opening; caudal peduncle, caudal fin, and posterior part of dorsal fin yellowish; pectoral fin light yellow.

This species was fairly common in quiet water with living coral in both outer reef and lagoon areas.

Pomacentrus jenkinsi

Pomacentrus jenkinsi Jordan and Evermann 1903. Bull. U. S. Fish Comm., vol. 22, p. 189. (Type locality, Honolulu).

Pomacentrus inornatus Schultz (not of De Vis) 1943. Bull. U. S. Nat. Mus. 180, p. 184.

20 specimens. 50 - 76 mm. Onotoa.

4 specimens. 72 - 80 mm. Tarawa.

Like nigricans, P. jenkinsi is a drab species. It is dark brown with axil and extreme upper edge of pectoral fin black. It is easily confused with nigricans in the field. Without resorting to counting dorsal spines, the best means of separation is the presence on jenkinsi of vertical dark lines on the body (due to lower outer edges of scales being darker).

A common species, it was taken both on the outer reef and in the lagoon.

Table 4 Counts Made on the Pomacentridae Collected in the Gilbert Islands

Dorsal fin

	spines			soft rays										
	XI	XII	XIII	9	10	11	12	13	14	15	16	17	18
Am. bicinctus	3									1	1	1	
Am. sebae	1										1		
D. aruanus		10					10						
D. trimaculatus		1								1			
C. lepidolepis		2					2						
C. caeruleus		12		1	11								
C. xanthochir			1			1							
C. dimidiatus		22					22						
C. opercularis			5		1	4							
Ab. sordidus			2						1	1			
Ab. septemfasciatus			5				3	2					
Ab. saxatilis			2				2						
Ab. phoenixensis		2										2	
Ab. dicki		6										4	2
Ab. lacrymatus		10								3	6	1	
Ab. leucopomus			2				2						
Ab. glaucus			3				3						
Ab. amabilis			9				9						
Ab. biocellatus			4					4					
Ab. zonatus			4					4					
P. aureus		2									2		
P. albofasciatus		1							1				
P. eclipticus		10								8	2		
P. nigricans		17								6	9	2	
P. pavo			9					8	1				
P. coelestis			4						4				
P. vaiuli			12						1	6	5		
P. jenkinsi			12							2	9	1	

Table 4 (Cont.) Anal fin

	spines	soft rays							
	II	9	10	11	12	13	14	15	16
Am. bicinctus	3					2	1		
Am. sebae	1					1			
D. aruanus	10				9	1			
D. trimaculatus	1						1		
C. lepidolepis	2			2					
C. caeruleus	12	2	10						
C. xanthochir	1			1					
C. dimidiatus	22			1	20	1			
C. opercularis	5			5					
Ab. sordidus	2						1	1	
Ab. septemfasciatus	5				5				
Ab. saxatilis	2				2				
Ab. phoenixensis	2					1	1		
Ab. dicki	6						3	3	
Ab. lacrymatus	10					8	2		
Ab. leucopomus	2				2				
Ab. glaucus	3				3				
Ab. amabilis	9				9				
Ab. biocellatus	4				1	3			
Ab. zonatus	4					4			
P. aureus	2				2				
P. albofasciatus	1				1				
P. eclipticus	10				9	1			
P. nigricans	17					14	3		
P. pavo	9					8	1		
P. coelestis	4							4	
P. vaiuli	12							4	8
P. jenkinsi	12				1	7	4		

Table 4 (Cont.)

	Pectoral rays**						Vertical scale rows*						
	16	17	18	19	20	21	25	26	27	28	29	50	51
Am. bicinctus					2	1						2	1
Am. sebae					1							1	
D. aruanus		1	5						5				
D. trimaculatus				1					1				
C. lepidolepis			2						2				
C. caeruleus		2	8	2			3	3					
C. xanthochir				1						1			
C. dimidiatus	2	20					1	4					
C. opercularis			1	4					2	3			
Ab. sordidus			1	1					2				
Ab. septemfasciatus			3					1	2				
Ab. saxatilis			1	1				1	1				
Ab. phoenixensis						2	1	1					
Ab. dicki			1	4	1			2	2	2			
Ab. lacrymatus				5	5		4	1					
Ab. leucopomus			1	1			2						
Ab. glaucus		1	2					1	1				
Ab. amabilis			3	5	1		1	1	1				
Ab. biocellatus			4				2	2					
Ab. zonatus			4				1	3					
P. aureus				1	1				1	1			
P. albofasciatus				1					1				
P. eclipticus					9	1	1	4					
P. nigricans			4	12	1		1	6					
P. pavo	6	3					1	2	1				
P. coelestis		2	2						2	2			
P. vaiuli		6	6				4	1					
P. jenkinsi					9	3			2	3	1		

* All elements of pectoral fin counted.

** Vertical scale rows counted from upper edge of gill opening to end of hypural plate (generally the last large scale is at this location).

Family MALACANTHIDAE

Genus MALACANTHUS

Malacanthus Cuvier 1829. Règne animal, ed. 2, p. 264. (Type species, Coryphaena plumieri Bloch).

Malacanthus hoedti

Malacanthus hoedti Bleeker 1859. Act. Soc. Sci. Indo-Neerl. vol. 6, p. 18. (Type locality, New Guinea).

Malacanthus hoedti Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 292. (Nauru).

Family LABRIDAE

More species of wrasses were taken in the Gilbert Islands than any other family of fishes; however, there are still many as yet unrecorded which must occur there. Most were very highly colored and had the characteristic projecting teeth anteriorly in the jaws. The Gilbertese did not distinguish the smaller species with different names, the single name Tearinai being applied to nearly all of them.

Genus THALASSOMA

Thalassoma Swainson 1839. Nat. hist. class. fishes, amphibians,...vol. 2, pp. 172, 224. (Type species, Scarus purpureus Forskål).

Thalassoma purpureum

Scarus purpureus Forskål 1775. Descr. animalium, pp. x, 27. (Type locality, Djedda, Red Sea).

Thalassoma quadricolor Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 298. (Nauru).

1 specimen. 260 mm. Tarawa.

D VIII,13; A III,11; P 16; gill rakers 24.

Color in alcohol: head and an irregular band dorsally on body purplish gray; body light brown; a pale reddish irregular band running from eye diagonally across operculum, forking posteriorly; two lengthwise pale reddish bands on side of body; upper axil of pectoral blackish; outer part of pectoral fin faintly blackish; a blackish spot anteriorly in dorsal fin.

Thalassoma trilobatum

Labrus trilobatus Lacépède 1802. Hist. nat. poiss., vol. 3, pp. 454, 526. (Type locality, "le grand Océan équatorial").

Labrus fuscus Lacépède 1802 (not of Gmelin, 1788). Hist. nat. poiss., vol. 3, pp. 437, 493.

Thalassoma fuscum Jordan and Evermann 1905. Bull. U. S. Fish Comm., vol. 23, pt. 1, pp. 295, 299, pl. 34 (erroneously labelled purpureum).

2 specimens. 116 and 132 mm. Onotoa.

D VIII,13; A III,11; P 16; lateral line scales 27; gill rakers 20 (2 specimens).

Color from 35 mm Kodachrome transparency: head and anterior part of body orangish yellow; posterior part salmon orange; two broad longitudinal bands of more-or-less rectangular blue-green blotches on side of body (4 or 5 of these blotches in the upper band extend to base of dorsal fin); a vertical blue line posteriorly on opercle; a short blue line above and one below eye; caudal fin yellow with horizontal blue lines, especially posteriorly; dorsal fin orange with green blotches along base, a blue line distally and a black spot on first interspinous membrane; anal fin orange on basal half, bright blue on distal half; pectoral hyaline with a blue line at base ending at upper edge in a blackish spot; pelvics light blue.

This species was seen only on the outer sea reef, especially in the surge channel zone.

The stomach contents of one of the specimens consisted of fragments of a good-sized brachyuran crab. The test of the crab was orange-red with white nodules.

Thalassoma umbrostygma

Julis umbrostygma Rüppell 1835. Neue Wirbelth. Fische, p. 11, pl. 3, fig. 2. (Type locality, Red Sea).

Julis umbrostigma Günther 1909. Jour. Mus. Godeffroy, vol. 6, pt. 16, p. 294, pl. 59, fig. B. (Kingsmill Islands).

2 specimens. 106 and 121 mm. Onotoa.

2 specimens. 122 and 128 mm. Tarawa.

D VIII,13; A III,11; P 16; lateral line scales 27; gill rakers 20 or 21. (2 specimens).

Color from 35 mm Kodachrome transparency dusky red dorsally, shading to salmon pink on side, and white ventrally; 2 longitudinal broad bands of more-or-less rectangular green blotches on side of body (upper part of each green blotch of upper band extends irregularly to base of dorsal fin; broad green lines radiating from eye; dorsal fin deep orange-yellow with a green band, and a prominent black spot on first interspinous membrane; anal fin salmon colored with 2 green bands; caudal fin deep orange-yellow with traces of green especially posteriorly on upper and lower lobes; pectoral fins hyaline-yellowish; pelvic fins white.

This species was also seen only in outer reef areas where the water was turbulent.

The stomach contents of the large Onotoa specimen were examined. This labrid had eaten the same kind of crab as the specimen of T. trilobatum.

Thalassoma quinquevittatum

Scarus quinquevittatus Lay and Bennett 1839. Zool. Capt. Beechey's voyage, p. 66, pl. 19, fig. 3. (Type locality, Loo Choo Islands).

24 specimens. 39 - 125 mm. Onotoa.

2 specimens. 89 and 108 mm. Tarawa.

D VIII,13; A II,11; P 16; lateral line scales 27; gill rakers 23. (2 specimens).

Color from 35 mm Kodachrome transparency of 125 mm specimen: body except abdomen green with a very broad rose pink band on the back and side containing a band of connected green blotches which shade to blue on caudal peduncle (this blue connects at base of caudal fin with a similar blue band on caudal peduncle at margin of the broad rose pink band; abdomen purplish with 3 diagonal blue bands separated by rose pink; head greenish (reddish on upper part of opercle and on region from chin to eye,) with blue bands radiating from eye; a blue line under chin; dorsal fin rose pink, green on margin; a black spot on first two interspinous membranes of dorsal fin; caudal fin bright orange except upper and lower lobes which are rose pink; anal and pectoral fins hyaline; a black spot at upper edge of base of pectoral fin; pelvic fins light purplish.

Smaller specimens have a row of black spots on the back along the base of the dorsal fin, the most prominent one being at the axil of the dorsal, and a black spot basally on the membrane between the second and third dorsal soft rays.

This colorful species was the most abundant of the genus at Onotoa and was seen in many different habitats.

The stomachs of two adult specimens were opened. One contained a small pelecypod, and the other a crangonid shrimp.

Thalassoma hardwickei

Sparus hardwicke Bennett 1828. Fish. Ceylon, pl. 12. (Type locality, Ceylon).

Julis dorsalis Quoy and Gaimard 1834. Voyage "Astrolabe", Zool., vol. 3, p. 713, pl. 15, fig. 5.

Thalassoma dorsale Jordan and Seale 1906. Bull. U. S. Bur. Fish., vol. 25, p. 306.

8 specimens. 25 - 103 mm. Onotoa.

D VIII,13; A II,10 or 11; P 16; lateral line scales 27; gill rakers 22 or 23. (2 specimens).

Color from 35 mm Kodachrome transparency of an 88 mm specimen: body light blue dorsally and on side and white ventrally with 5 broad dark purple bars on back, the first extending from origin of dorsal to axil of pectoral fin and the last from base of last few dorsal rays to lateral line; head light violet dorsally, white ventrally, with light red lines radiating from eye; a black spot (2 black spots on some specimens) in a small dark purple area dorsally on caudal peduncle; a black spot anteriorly in dorsal fin; a black spot at upper edge of base of pectoral fin.

In the 103 mm specimen the region from base of caudal fin to gill opening is black, and there is a black line basally in the dorsal fin. The 25 mm specimen shows the same saddle-like bars on the body as in adults. There is a black spot in the middle of the dorsal fin as well as anteriorly.

Thalassoma melanochir

Julis melanochir Bleeker 1857. Act. Soc. Sci. Indo-Neerl., vol. 2, p. 77. (Type locality, Ambon, East Indies).

Thalassoma marnae Schultz 1943. Bull. U. S. Nat. Mus. 180, p. 203, fig. 17.

2 specimens. 84 and 90 mm. 8 specimens. 43 - 67 mm. Onotoa.

D VIII,13; A II,11; P 15; lateral line scales 27; gill rakers 14 to 17. (7 specimens).

Color in life of 84 mm specimen: dark green on back shading to light purplish ventrally with vertical red lines on scales (these more pronounced in middle of body); a broad region from nape to about mid-point of spinous portion of dorsal fin yellow-green (more green dorsally, more yellow ventrally) (no evidence of this color in preserved specimen); head bluish purple with a green area antero-ventral to eye; a narrow dark purple-bordered gold band from snout through lower third of eye nearly to end of operculum; a similar band from corner of mouth to postero-ventral portion of operculum; dorsal fin red with oblique dusky streaks, a narrow clear margin, and a thin submarginal black line; caudal fin hyaline except for reddish brown on upper and lower lobes; pectoral yellow, black at base, with a large black area in outer part of fin.

The 2 large specimens were speared next to a large coral head in the lagoon.

The smaller specimens fit the description of Thalassoma marnae Schultz. The largest is losing the black band down the middle of the body; all but the smallest specimen display faint vertical dark lines on the scales. The gill rakers of the two large specimens number 14 and 16. Those of 5 of the smaller specimens range from 15 to 17. The type of marnae has 16 gill rakers.

Thalassoma lunare

Labrus lunaris Linnaeus 1758. Syst. nat., ed. 10, p. 283. (Type locality, India).

2 specimens. 120 and 125 mm. Onotoa.

D VIII,13; A II,11; P 15 or 16; lateral line scales 27; gill rakers 16 and 19. (2 specimens).

Color in life; body forest green with narrow vertical purplish red lines on scales; head green with violet stripes; central and posterior part of caudal fin bright yellow, bordered with blue; elongate upper and lower lobes of caudal fin orange with narrow blue margins; basal part of dorsal fin green, outer part orange; pectoral fin blue with second to sixth rays orange except for basal and extreme distal portions (this orange color preserves as an elongate blackish area). Not noted in the field but readily apparent in both specimens in alcohol are 4 dark bands on the abdomen, the two median ones extending to anal fin.

The specimens were speared in the lagoon where the maximum depth of the water was 20 feet, but numerous coral heads reached to 5 feet of the surface.

The species of *Thalassoma* in Oceania which develop a black area in the pectoral fin include *melanochir* (Bleeker), *lunare* (Linnaeus), *lutescens* (Lay and Bennett), *aneitensis* (Günther), *duperreyi* (Quoy and Gaimard), and *neanis* Jordan and Evermann (*in* Jordan and Snyder, 1907). The latter two species are apparently restricted to the Hawaiian Islands. In addition to color, gill raker and pectoral fin ray counts are useful in separating the species of this group, *T. lutescens* and *T. neanis* have a total of 16 rays in the pectoral, the others (*aneitensis* not seen) generally 15. *T. melanochir* has 14 to 17 gill rakers; *lunare* counts in the Gilbert Islands were 16 and 19 (three from the Philippines had 18 to 20); three examples of *lutescens* from the Marshall Islands had 22 or 23 rakers, three *duperreyi* from Midway Island and 21 or 22; the type of *neanis* has 17.

Fowler (1928: 354) has placed *neanis* in the synonymy of *lutescens*. Admittedly these two are closely related; if the life color as given by Jordan and Evermann (p. 214, and pl. 12, fig. 2) is correct (especially with respect to the lack of vertical lines on the scales), I believe they are distinct species. Adult *lutescens* in the Marshall Islands are yellow with orange stripes on the head and abdomen; there is a lengthwise orange band down the middle of the dorsal fin, a black spot centered on the second dorsal spine, an orange band at the base of the anal fin, orange upper and lower lobes of caudal fin, and orange vertical lines on body scales; there is a black spot at the upper edge of the base of the pectoral and a blackish area in the outer part of the fin.

No specimens of *lutescens* were seen in the Gilbert Islands. The species was common in the Marshall Islands. I have not seen the specimen from Honolulu identified by Jordan and Evermann (*Bull. U. S. Fish. Comm.*, vol. 23, 1905: 303) as *Thalassoma lunaris* and later by Jordan and Snyder (*Bull. U. S. Bur. Fish.*, vol. 26, 1907: 214) as *lutescens*.

Julis aneitensis Günther (1862) may be a synonym of *lutescens*. I have examined no specimens of the former. The specimen collected by Berndt and identified by Jordan and Evermann (1905: 304, pl. 41) as *Thalassoma aneitense* is probably *neanis*. The white spots on the scales as described and figured seem to be some sort of deposit on the underside of the scales and may be an artifact of preservation.

Genus HALICHOERES

Halichoeres Rüppell 1835. Neue Wirbelth., Fische, p. 14. (Type species, *Halichoeres bimaculatus* Rüppell).

Halichoeres centriquadrus

Labrus centriquadrus Lacépède 1802. Hist. nat. poiss., vol. 3, pp. 437, 493. (Type locality, Madagascar, Mauritius, and Réunion)

Labrus hortulanus ibid, pp. 449, 518.

Halichöres eximius Rüppell 1835. Neue Wirbelth., Fische, p. 16, pl. 5, fig. 1.

8 specimens. 68 - 140 mm. 3 specimens. 25 - 43 mm. Onotoa.

2 specimens. 126 and 128 mm. Tarawa.

D IX,11; A II,11; P 14; lateral line scales 28. (3 specimens).

Color from 35 mm Kodachrome transparency of 135 mm specimen: body light gray dorsally, white on sides and abdomen, with an elongate black spot at the base of each scale; two prominent yellow spots on back adjacent to dorsal fin, the first at base of fourth to fifth dorsal spines and followed by a blackish area, and the second at the base of the fifth to sixth dorsal soft rays; head light gray (snout greenish) with irregular short pink bands; dorsal orangish with numerous yellow spots (more evident basally); caudal fin bright orange-yellow; anal fin light yellow; pectoral fin hyaline with a black spot at upper edge of base; pelvic fins white.

The two smallest specimens (25 and 38 mm) have a different color pattern from the larger specimens, as is so often true of the Labridae. There is a large black spot on the nape, a large black ocellated spot in the middle of the dorsal fin, and a large black spot basally at the anterior part of the anal fin; lesser black spots are present on dorsal and ventral edges of the caudal peduncle, mid-centrally at base of caudal fin, and on body at base of last few anal rays. In the middle of the body running from dorsal to anal and pelvic fins and on the caudal peduncle there is a network of scales with dark edges (this pattern on the scales of the body is similar to that of H. margaritaceus; in the latter species the dark edged scales are restricted mostly to the dorsal half of the body). A 42 mm specimen has lost most of the black spots except the dorsal ocellus; a 68 mm specimen still has a vestige of the dorsal ocellus.

Rüppell's plate of H. eximius from the Red Sea shows some differences in color from the Gilbert Islands specimens. Notable are the blue-green ground color, three instead of two yellow spots on the back; lack of a black spot behind the first yellow spot, and presence of a small black spot at upper base of caudal fin. These differences are perhaps of sufficient magnitude to recognize them by applying subspecific names. I definitely do not regard them as distinct species, however.

This species of Halichoeres was common. It did not seem to prefer any specific habitat, but was seen in nearly all areas.

The stomach contents of two adult specimens were examined. They consisted mostly of small gastropods and pelecypods. In both stomachs the remains of a single unidentified crustacean were found.

Halichoeres trimaculatus

Julis trimaculata Quoy and Gaimard 1834. Voyage "Astrolabe", Zool., vol. 3, p. 705, pl. 20, fig. 2. (Vanikolo).

Platyglossus vicinus Günther 1909. Jour. Mus. Godeffroy, vol. 6, pt. 16, p. 267, pl. 142, fig. C. (Kingsmill Islands).

23 specimens. 29 - 95 mm. Onotoa.

D IX,11; A II,11; P 14; lateral line scales 27. (4 specimens).

Color in life of 95 mm specimen: back greenish, shading to light tan below; outer edges of scales darker on upper two-thirds of body; head green, the upper half from snout to just behind eye irridescent light green, with bright orange-rose bands which are narrowly dark bordered; roundish and elliptical spots of orange-rose on head behind eye, on nape, and anteriorly on body to pectoral region; a long orange band from axil of pectoral obliquely downward and backward almost to mid-pelvic region (this band shaded outwardly with blue); a dark purple spot above lateral line on caudal peduncle broadly bordered with bright green; dorsal fin with 2 orange-pink bands in spinous portion and 3 in soft portion; anal fin greenish in proximal half with a rosy lengthwise band in middle of fin; caudal fin orange.

Many specimens were very pale and had little bright color; these were connected with intermediates to the darker, more colorful form as depicted above.

This species is abundant; it appears to be primarily a lagoon form. It was seen in outer reef areas only where the water was quiet and the bottom predominately sandy.

Halichoeres margaritaceus

Julis margaritaceus Cuvier and Valenciennes 1839. Hist. nat. poiss., vol. 13, p. 484. (Type locality, Vanicolo).

Julis kawarin Bleeker 1852. Nat. Tijdschr. Ned.-Ind., vol. 3, p. 172.

Halichoeres kawarin Bleeker 1862. Atlas ichth., vol. 1, p. 121, pl. 41, fig. 4.

Platyglossus kawarin Günther 1909. Jour. Mus. Godeffroy, vol. 6, pt. 16, p. 266, pl. 142, fig. B. (Kingsmill Islands).

3 specimens. 40 - 71 mm. Onotoa.

2 specimens. 54 and 55 mm. Nukunau.

D IX, 11; A II,11; P 13 or 14; lateral line scales 27 or 28. (3 specimens).

Color in alcohol light tan with edges of most of scales dark brown on dorsal two-thirds of body (groups of scales within this region without dark pigment, giving an overall mottled effect) (in the 71 mm specimen the scales are more broadly darkened); head with dark stripes running through eye (faint in small specimens); a vertical black mark just behind eye; a blackish spot on opercular membrane (much more evident on large specimen); a black ocellus in outer part of dorsal fin between second and third soft rays (nonocellated in 71 mm specimen); rest of dorsal fin with faint irregular lines which outline pale spots; remaining fins pale.

Halichoeres marginatus

Halichöres marginatus Rüppell 1835. Neue Wirbelth., Fische, p. 16. (Type locality, Red Sea).

Julis notopsis Cuvier and Valenciennes 1839. Hist. nat. poiss., vol. 13, p. 485.

Platyglossus marginatus Bleeker 1862. Atlas ichth., vol. 1, p. 109, pl. 41, fig. 3.

Platyglossus notopsis Bleeker 1862. Atlas ichth., vol. 1, p. 111, pl. 41, figs. 1, 2.

Halichoeres marginatus Schultz 1943. Bull. U. S. Nat. Mus. 180, pp. 208, 210.

Halichoeres notopsis Schultz ibid.

3 specimens. 81 - 104 mm. 4 specimens. 26 - 63 mm.
Onotoa.

D IX,13; A II,12; P 14; lateral line scales 28. (4 specimens).

Color in life of the 81 mm specimen: body green except antero-dorsal portion which is blue; 4 lengthwise lines of bright red spots beneath pectoral fin; head blue with orange stripes, these becoming golden on nape; dorsal and anal fins dark purplish blue with a narrow green margin and a light blue submarginal line; caudal fin green with a large light blue-edged, dark blue crescent-shaped blotch, the upper and lower edges of which reach the upper and lower margins of the fin (concave side of crescent faces anteriorly); pectoral membranes hyaline.

In the field I identified the four smaller specimens as notopsis. Upon closer examination I am convinced that notopsis is the young of marginatus. The 26 mm specimen is pale with 5 dark brown bands running the entire length of the body from snout to base of caudal fin (these bands about as wide as alternating pale interspaces). There is a prominate ocellated black spot in the dorsal fin between the second and fifth soft rays. In a 39 mm specimen the dark bands are twice as broad as the pale. In a 60 mm specimen they are no longer apparent. A dusky area can be seen in the caudal fins of the 60 and 63 mm specimens which presages the formation of the dark crescent-shaped blotch so typical of marginatus. The ocellus is still evident in the dorsal fin in these specimens, though the dorsal fin has become darker. The 81 mm specimen has the adult coloration of the species. In this and even the 104 mm specimen the ocellus can be faintly made out if the dorsal fin is elevated with a bright light behind it. Small pale spots develop in the fin and invade the ocellus and the intensity of the black spot diminishes. The last remnant of the ocellus is the pale ring. A pale margin develops on the dorsal and anal fins during this same period of alteration in color.

Two of the specimens were collected from protected waters of the outer reef and the rest in the lagoon.

Genus MACROPHARYNGODON

Macropharyngodon Bleeker 1861. Proc. Zool. Soc. London, p. 412. (Type species, Julis geoffroyi Quoy and Gaimard).

Macropharyngodon geoffroyi

Julis Geoffroy Quoy and Gaimard 1824. Voyage autour du monde ..."Uranie", Zool., p. 270, pl. 56, fig. 3. (Type locality, Hawaiian Islands).

Julis meleagris Cuvier and Valenciennes 1839. Hist. nat. poiss., vol. 13, p. 481. (Type locality, Ulea = Woleai, Caroline Islands).

2 specimens. 72 and 76 mm. Onotoa lagoon.

D IX,11; A II,11; P 12; lateral line scales 28; gill rakers 17 (2 specimens).

Color in alcohol blackish with a slightly paler spot in the center of each scale; 2 black spots, one above the other, just posterior to upper end of gill opening; a black spot anteriorly on isthmus; head with pale dark-edged bands radiating from eye or running diagonally below eye and with pale dark-edged spots ventrally; median fins light dusky with irregular pale bands and spots; a blackish area anteriorly in dorsal fin; paired fins hyaline.

Some authors have considered the species in Hawaii distinct from that in the rest of the Indo-Pacific, giving the latter the name of meleagris (Cuvier and Valenciennes). I compared two specimens from the Hawaiian Islands with the two from the Gilbert Islands. Counts of fin rays, lateral line scales, and gill rakers of the Hawaiian specimens were identical with counts of the ones from the Gilberts. I can find only slight color differences as follows: the Hawaiian specimens lack the black spots just behind the upper end of the gill opening and the spot on the isthmus, and the bands on the head are narrower. In my opinion these differences are not specific.

Macropharyngodon pardalis

Leptojulis pardalis Kner 1867. Sitz. Akad. Wiss. Wien., vol. 56, p. 728. (Type locality, Fiji Islands).

3 specimens. 58 - 67 mm. Onotoa lagoon.

D IX,11; A II,11; P 12; lateral line scales 28. (2 specimens).

Color in life white, light greenish on back, with numerous large irregular black spots on body and most of head; dusky orange lines on snout and interorbital space; dorsal and caudal fins with small brownish orange spots (these form vertical lines on caudal); anal fin yellow with a row of black spots basally and small orange spots distally;

pectoral clear; iris of eye yellow with a green ring and 4 short radiating red-orange lines.

Genus LABRICHTHYS

Labrichthys Bleeker 1854. Nat. Tijdschr. Ned.-Ind., vol. 6, p. 331. (Type species, Labrichthys cyanotaenia Bleeker).

Labrichthys cyanotaenia

Labrichthys cyanotaenia Bleeker 1854. Nat. Tijdschr. Ned.-Ind., vol. 6, p. 331. (Type locality, Larantuka, Flores).

1 specimen. 30 mm. Onotoa.

D IX,11; A III,10; P 14; lateral line scales 27.

Color in alcohol dark brown with a pale line from snout through lower part of eye to middle of caudal fin; a second pale longitudinal line, less distinct than the first, runs from chin, beneath base of pectoral, to lower part of caudal peduncle; margins of median fins hyaline; pectoral pale, the extreme basal part of the rays whitish; pelvic fins pale with dusky centers.

The coloration as described above is based on the single 30 mm specimen taken. This is different from the usual color pattern of numerous faint longitudinal pale lines, but I believe my specimen exhibits the juvenile color pattern for the species. It has the well-developed fleshy tubular lips and peculiar dentition of the genus.

Genus LABROIDES

Labroides Bleeker. 1851. Nat. Tijdschr. Ned.-Ind., vol. 2, p. 249. (Type species, Labroides paradiseus Bleeker = dimidiatus Cuvier and Valenciennes).

Labroides dimidiatus

Cossyphus dimidiatus Cuvier and Valenciennes 1839. Hist. nat. poiss., vol. 13, p. 136. (Type locality, Mauritius).

4 specimens. 50 - 82 mm. Onotoa.

D IX,11; A III,10; P 13; lateral line scales 52 or 53. (3 specimens).

Color in life bright light blue with a black band running from snout through eye along upper part of body to end of caudal fin, this band becoming progressively broader as it passes posteriorly; a black line at base of anal fin which connects narrowly with a hook-like ventral extension from end of broad black band on caudal fin; a vertically-elongate small black spot below axil of pectoral; dorsal fin black basally, pale distally; paired fins pale.

This species was seen only in quiet outer reef areas or in the lagoon. It often exhibited an unusual mode of swimming by oscillating the posterior part of the body up and down as if to attract attention. It was seen to dance around other fishes in this manner and to intermittently pick at their bodies. The fishes receiving such attention often slowed their swimming or came to a stop. It was thought at the time that the Labroides were picking off external parasites from these fishes. The gut contents of two specimens from the Gilbert Islands and three from the Marshall Islands consisted of calagoid copepods and a few fish scales. The two remaining Gilbert Islands specimens had eaten tiny isopods along with several fish scales.

Barnard (1927: 749) noted the great resemblance of Labroides dimidiatus to the petroscirtian blenny, Aspidontus taeniatus, and suggested that the phenomenon of mimicry might be involved. He offered no explanation of such mimicry beyond a statement that one of the two species might have poisonous qualities. The similarity in color pattern of these two phylogenetically dissimilar species is certainly striking, and mimicry might well be operative. If so, it is my belief that the blenny is mimicking the labrid. Labroides dimidiatus may escape predation by virtue of its parasite-feeding habit. A blenny of comparable size and the same color pattern might gain the same protection.

Labroides bicolor

Labroides bicolor Fowler and Bean 1928. Bull. U. S. Nat. Mus. 100, vol. 7, p. 224. (Type locality, Port Maricaban, Philippine Islands).

1 specimen. 81 mm. Onotoa.

D IX,12; A III,10; P 13; lateral line scales 25.

Color from 35 mm Kodachrome transparency: head and anterior part of body black; posterior part of body and caudal peduncle bright yellow (this yellow region rounded anteriorly); caudal fin green anteriorly and centrally, this area outlined posteriorly by a black crescent; region of caudal fin posterior to the crescent light blue; margin of soft portion of dorsal fin and anal fin light bluish; pectoral fins pale; pelvic fins black.

This rare species was sighted only twice, both times on the coralliferous terrace of the windward reef. The single specimen taken was obtained with a spear.

Genus STETHOJULIS

Stethojulis Günther 1862. Cat. Fishes British Mus., vol. 4, p. 140. (Type species, *Julis strigiventer* Bennett).

Stethojulis strigiventer

Julis strigiventer Bennett 1832. Proc. Comm. Zool. Soc. London, p. 184. (Type locality, Mauritius).

Julis (*Halichoeres*) *Renardi* Bleeker 1851. Nat. Tijdschr. Ned.-Ind., vol. 2, p. 253.

Stethojulis strigiventer Bleeker 1862. Atlas ichth., pl. 43, fig. 1.

Stethojulis Renardi Bleeker, ibid., fig. 2.

10 specimens. 52 - 75 mm. Onotoa lagoon.

D IX,11; A III,11; P 14 or 15 (mostly 15); lateral line scales 27; gill rakers 24 to 26. (5 specimens).

Color in alcohol of a 65 mm female specimen: light brown except upper part of head and nape above lower edge of eye which is dark brown; narrow lengthwise white lines on lower half of body; a small black spot (a pair of spots on some specimens) at base of caudal fin just above last lateral line scale.

Five of my specimens were identified in the field as S. *renardi*. These ranged from 72 to 75 mm in standard length and were more colorful than the smaller *strigiventer*. The lower half of the body was whiter with only traces of brownish longitudinal lines; on the upper half of the head and body were 4 dark-edged red lines as figured for *renardi* in Bleeker; the area between the two lowermost red lines was blue.

I sexed these five specimens and found that all were males. The five specimens of *strigiventer* (52 to 69 mm) were either males or females.

I then examined a large series of specimens of both species in the United States National Museum which were collected at Guam. There were 18 specimens of *renardi*, ranging from 62 to 81 mm, and all were males. 42 specimens larger than 34 mm were labelled *strigiventer*; of these 14 were females from 63 to 68 mm. The remaining 28 consisted of 16 females and 12 males. Three specimens, 61 to 62 mm in standard length, were intermediate in color pattern to typical *renardi* and *strigiventer*. I therefore conclude that *renardi* is the large adult male of *strigiventer*.

The male apparently reaches a larger size than the female. The largest female specimen was 68 mm; 10 males were longer than 70 mm.

In addition to the small caudal spot, the smaller specimens had a tiny black spot on the next to last dorsal ray near the base and another on the next to last anal ray. The anal spot disappears at a size of about 50 mm in standard length and the dorsal spot at a length of about 64 mm.

Stethojulis axillaris

Julis axillaris Quoy and Gaimard 1824. Voyage autour du monde..."Uranie", Zool., p. 272. (Type locality, Hawaiian Islands).

10 specimens. 38 - 80 mm. Onotoa.

D IX,11; A II,11; P 14; lateral line scales 27. (4 specimens).

Color in alcohol of a 64 mm specimen: dorsal half of head and body dark grayish brown, lower half light brown, these two areas separated by a light brown band (smaller specimens with a second pale band from above eye to top of caudal peduncle); 1 to 3 small black spots in mid-line at base of caudal fin; all fins pale. Small specimens with a small black spot on anal fin near base of last 2 anal rays.

In life there was an orange area at upper axil of pectoral fin and a yellow band from snout to lower edge of eye continuing as a light gray band to base of caudal.

This species is apparently abundant throughout all of Oceania. It was taken in several different habitats at Onotoa from shallow lagoon to outer reef.

Stethojulis sp.

Stethojulis casturi Günther 1909 (not of Bleeker). Jour. Mus. Godeffroy, vol. 6, pt. 16, pl. 141, fig. A.

Stethojulis albovittata Fowler 1928 (in part). Mem. B. P. Bishop Mus., vol. 10, p. 335. (Kingsmill Islands).

Stethojulis casturi Schultz 1943. Bull. U. S. Nat. Mus. 180, pp. 213, 214.

3 specimens. 74 - 82 mm. Onotoa.

D IX,11; A II (III?),11; P 14 or 15; lateral line scales 27. (2 specimens).

Color in life like the plate of *S. casturi* in Günther (1909) and the key to *casturi* in Schultz (1943: 213).

This species will be described as new by Schultz in volume 2 of the Fishes of the Marshall and Marianas Islands. The species first described as *casturi* (Bleeker, 1852) is now recognized as *trilineata* (Bloch and Schneider).

De Beaufort (1940: 161) has discussed the problem of whether to consider *Stethojulis albovittata* (Bonnaterre) (pl. 141, fig. B in Günther, 1909) a distinct species or just a color variety of the form known in recent times as *casturi* (pl. 141, fig. A in Günther, 1909).

Genus CORIS

Coris Lacépède 1802. Hist. nat. poiss., vol. 3, pp. 96, 97. (Type species, *Coris aygula* Lacépède).

Coris gaimardi

Julis gaimard Quoy and Gaimard 1824. Voyage autour du monde..."Uranie", Zool., p. 265, pl. 54, fig. 1. (Type locality, Maui, Hawaiian Islands).

No specimens of this colorful species were collected in the Gilbert Islands. D. W. Strasburg sighted one when swimming underwater at Onotoa.

Genus NOVACULICHTHYS

Novaculichthys Bleeker 1861. Proc. Zool. Soc., p. 414. (Type species, *Labrus taeniourus* Lacépède).

Novaculichthys taeniourus

Novaculichthys taeniourus Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 363, pl. 41, fig. A. (Kingsmill Islands).

Genus ANAMPSES

Anampses Quoy and Gaimard 1824. Voyage autour du monde... "Uranie", Zool., p. 276. (Type species *Anampses cuvieri* Quoy and Gaimard).

Anampses caeruleopunctatus

Anampses caeruleopunctatus Rüppell 1828. Atlas Reise nördlichen Afrika. Fische, p. 42, pl. 10, fig. 1. (Type locality, Red Sea).

No specimens were collected in the Gilbert Islands. I observed the species on several occasions on Onotoa reefs.

Genus GOMPHOSUS

Gomphosus Lacépède 1802. Hist. nat. poiss., vol. 3, p. 100. (Type species, Gomphosus caeruleus Lacépède).

Gomphosus tricolor

Gomphosus tricolor Quoy and Gaimard 1824. Voyage autour du monde..."Uranie", Zool., p. 280, pl. 55, fig. 2. (Type locality, Hawaiian Islands).

3 specimens. 125 - 230 mm. Onotoa.

D VIII,13; A II,11; P 16; lateral line scales 27. (2 specimens). Gill rakers 23 (1 specimen).

Color from 35 mm Kodachrome transparency of 230 mm specimen: head purplish black, body bluish green with a light apple green band from nape to pectoral fin base; dorsal and anal fins and a large crescent-shaped area posteriorly in caudal fin turquoise blue; pectoral fin blackish with outer edge broadly purple, and a black spot at upper edge of base.

The stomach contents of two specimens, 220 and 230 mm in standard length, were examined by A. H. Banner. The fish had eaten stomatopods and crangonid shrimps.

Gomphosus varius

Gomphosus varius Lacépède 1802. Hist. nat. poiss., vol. 3, pp. 100, 104. (Type locality, Tahiti).

4 specimens. 42 - 89 mm. Onotoa.

D VIII,13; A II,11; P 16; lateral line scales 27; gill rakers 24 and 25. (2 specimens).

Color in alcohol of 89 mm specimen: head and anterior half of body light tan, with a single black spot on outer edge of each scale of nape and body (except abdomen) and a horizontal black line through eye; posterior half of body blackish, the scales with similar black spots which, however, are visible only in the anterior part of black portion of body where pigmentation is not so intense; dorsal fin blackish with a narrow pale margin on soft portion; anal fin black with a pale margin and a pale spot on each interradial membrane; caudal fin black with a broad pale posterior margin; paired fins pale.

Color in life of 42 mm specimen: two narrow black bands running entire length of body, the first from snout through eye to upper base of caudal fin, the second from chin to lower base of caudal fin (the two bands connect irregularly at base of caudal fin); body dorsal to first band green, ventrally white.

Both species of Gomphosus were seen in the lagoon and outer reef areas, but never where wave action was strong.

Genus HEMIGYMNUS

Hemigymnus Günther 1861. Ann. Mag. Nat. Hist., London, vol. 8, p. 386. (Type species, Mullus fasciatus Thunberg = Labrus fasciatus Bloch).

Hemigymnus fasciatus

Labrus fasciatus Bloch 1792. Natur. ausländ. Fische, vol. 6, p. 6, pl. 290. (Type locality, Japan).

1 specimen. 205 mm. Onotoa.

D IX,11; A II,11; P 14; lateral line scales 28.

Color from 35 mm Kodachrome transparency: body black (except for chest anterior to origin of pelvic fins which is white) with 4 vertical white bars, the first running from anterior part of spinous portion of dorsal fin to mid-abdomen, the last crossing caudal peduncle; dorsal part of head and nape black; head below level of eye light yellow-green with broad, irregular, blue-edged, rose-colored bands; median and pelvic fins black; pectoral fin with rays black, membranes hyaline.

The one specimen seen was speared at a depth of about 30 feet on the coralliferous terrace of the outer reef.

Hemigymnus melapterus

Labrus melapterus Bloch 1791. Natur. ausländ. Fische, vol. 5, p. 137, pl. 285. (Type locality, Japan).

2 specimens. 100 and 119 mm. 1 specimen. 330 mm. Onotoa.

D IX,11; A II,11; P 14; lateral line scales 28. (2 specimens).

Color of 330 mm specimen after one day in formalin: dark green with a purplish cast; slightly curved vertical narrow blue lines on scales of body; head with tortuous rose bands except for a broad block of this color under eye; eye rimmed with irridescent green.

Color in life of 100 mm specimen: body anterior to a diagonal line of demarcation from second dorsal spine nearly to end of pelvic fins white; body posterior to this line to caudal peduncle black; caudal peduncle and caudal fin yellow; 3 black spots in a vertical line at base of caudal fin on one side of fish and a single spot at this location on the other side; head dorsal to lower edge of eye black, ventrally whitish; pale blue spots, one per scale, located posteriorly on black portion of body; dorsal fin black with a reddish marginal band; anal fin black with a narrow reddish margin and a blue submarginal band of about equal width.

Genus PSEUDOCHEILINUS

Pseudocheilinus Bleeker 1861. Proc. Zool. Soc. London, p. 409. (Type species, Cheilinus hexataenia Bleeker).

8 specimens. 38 - 49 mm. Onotoa.

Pseudocheilinus hexataenia

Cheilinus hexataenia Bleeker 1857, Act. Soc. Sci. Ind. Neerl., vol. 2, p. 4. (Type locality, Ambon, East Indies).

D IX, 11, A III,9; P 15 or 16; lateral line scales 23 (anterior part 18, peduncle part 5). (3 specimens).

Color from 35 mm Kodachrome transparency: body dark bluish (reddish on abdomen) with 6 lengthwise bright orange lines; a small black spot at upper edge of base of caudal fin; dorsal and anal fins orange, dusky blue at base; caudal fin green, outer part yellow; head bluish dorsally, shading to buff on snout and cheeks.

All specimens were secured with rotenone in the lagoon or protected outer reef waters.

Genus CHEILINUS

Cheilinus Lacépède 1802. Hist. nat. poiss., vol. 3, p. 529. (Type species, Cheilinus trilobatus Lacépède).

Cheilinus trilobatus

Cheilinus trilobatus Lacépède 1802. Hist. nat. poiss., vol. 3, pp. 529, 537. (Type locality, Madagascar, Mauritius, and Réunion).

9 specimens. 50 - 220 mm. 1 specimen. 17 mm.
Onotoa.

D IX,10; A III,8; P 12; lateral line scales 25 (anterior part 16, peduncular part 9). (5 specimens).

Color in life of 173 mm specimen olive brown with a vertical orange-red line in the middle of each body scale; numerous orange-red spots and short lines on head, the 4 longest lines radiating anteriorly from eye; chest and abdomen with large orange spots, the largest in mid-ventral line; soft dorsal and anal fins reddish with greenish rays; anal fin, in addition, blotched with brown; spinous portion of dorsal fin orange distally with a wavy green submarginal line, then a narrower orange line, and blotched orange and green at the base.

Smaller specimens usually had broad vertical dark and light areas on the side of the body and a series of about 5 dark spots midlaterally, the more posterior spots being more conspicuous. The 17 mm specimen is provisionally identified as trilobatus. It was green in life and had the 5 median spots on the body from behind gill opening to base of caudal fin.

The 220 mm specimen has a pronounced tri-lobed caudal fin.

The species was most commonly taken in the lagoon.

Cheilinus undulatus

Cheilinus undulatus Rüppell 1835. Neue Wirbelth. Fische, p. 20, pl. 6, fig. 2. (Type locality, Red Sea).

1 specimen 370 mm. 2 specimens 77 and 78 mm. Onotoa.

D IX,10; A III,8; P 12; lateral line scales 25 (anterior part 16, peduncular part 9). (2 specimens).

Color in life of 675 mm specimen (discarded in field due to large size): olive green with broad vertical dark brown lines on body scales (these lines anterior to tip of pectoral orange-brown); head reticulated with alternating orange and gray lines; 2 black lines extending posteriorly from orbit, the lowermost the longest; median fins narrowly barred with olive-green and brown; pectoral fins olive; pelvic fins dusky.

77 and 78 mm specimens with broad vertical dark bars on body due to a vertically elongate blackish spot on outer edge of each body scale in these areas and absence of this spot on most of the scales in intervening pale areas; two black lines extending diagonally and posteriorly from orbit and meeting just anterior to upper edge of gill opening; a

similar pair of dark lines extending anteriorly from eye toward mouth (these lines faint in 370 mm specimen).

The two small specimens were taken in a sandy-bottomed pond-like body of water narrowly confluent with the lagoon proper. The large specimens were taken from deeper water in outer reef areas. Individual fish of this species of very large size (estimated to 6 feet or more in length) with a large hump on the forehead were seen on many occasions at the extreme edge of the outer reef in about 50 feet of water. They were often almost motionless in the water or swam very slowly.

Cheilinus diagrammus

Labrus diagramma Lacépède 1802. Hist. nat. poiss., vol. 3, pp. 448, 518. (Type locality, "le grand Océan équatorial").

Cheilinus radiatus Bleeker 1862. Atlas ichth., p. 68, pl. 26, fig. 1.

2 specimens. 147 and 170 mm. Onotoa lagoon.

D IX,10; A III,8; P 12; lateral line scales 25 (anterior part 16, posterior part 9). (2 specimens).

Color in life: head and upper half of body greenish brown grading into dull orange on ventral half of body; a large vertical oblong red spot antero-centrally on each body scale; a series of about 5 orange-red lines on upper part of head parallel with upper profile of head; perpendicular to these on cheek another series of about 8 such lines which start out orange-red and shade into dark purple ventrally; base of caudal and upper and lower lobes dark purplish; outer, central part of caudal fin green; dorsal, anal, and pelvic fins reddish; pectoral fin light orange.

Cheilinus fasciatus

Sparus fasciatus Bloch 1791. Natur. ausländ. Fische, vol. 5, p. 18, pl. 257. (Type locality, Japan).

Cheilinus fasciatus, Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 360. (Kingsmill Islands).

Cheilinus chlorourus

Sparus chlorourus Bloch 1791. Natur. ausländ. Fische, vol. 5, p. 24, pl. 260 (Type locality, Japan and St. Domingo).

Cheilinus chlorurus, Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 362. (Kingsmill Islands).

Genus EPIBULIS

Epibulis Cuvier 1817. Règne animal, p. 264. (Type species *Sparus insidiator* Pallas).

Epibulis insidiator

Sparus insidiator Pallas 1770. Spicil. Zool., vol. 8, p. 41, pl. 5, fig. 1. (Type locality, Java).

4 specimens. 87 - 220 mm. Onotoa lagoon.

D IX,10; A III,8; P 12; lateral line scales 21 to 23 (anterior part 12 or 14, peduncular part 9 or 10). (3 specimens).

Color in life of 220 mm specimen dark yellowish brown with forest green edges to scales in middle of body; iris orange; fins dark brown except pectoral which is dusky orange.

No specimens in the yellow color phase were sighted.

Family SCARIDAE

The parrotfishes were one of the dominant families of fishes in the Gilbert Islands, as elsewhere in tropical marine waters. Taxonomically, they are a very difficult group; therefore much time was devoted to collecting them (mostly by spearing), making color notes, and taking color photographs. All of the specimens, field notes, and color pictures were made available to Dr. Leonard P. Schultz of the United States National Museum who is monographing the family. The Onotoa and Tarawa records listed below represent his identifications.

Genus SCARUS

Scarus Forskål 1775. Descr. animalium. p. 25. (Type species, *Scarus psittacus*).

Scarus sordidus

Scarus sordidus Forskål 1775. Descr. animalium, pp. x, 30. (Type locality, Red Sea).

Pseudoscarus abacurus Günther 1909. Jour. Mus. Godeffroy, vol. 6, pt. 16, p. 329, pl. 162). (Kingsmill Islands)

38 specimens. 38 - 200 mm. Onotoa.

2 specimens. 147 and 197 mm. Tarawa.

Scarus microrhinos

Scarus microrhinos Bleeker 1854. Nat. Tijdschr. Ned.-Indië, vol. 6, p. 200. (Type locality, Batavia, Java).

1 specimen. 285 mm. Onotoa.

Scarus harid

Scarus harid Forskål 1775. Descr. animalium, pp. x, 30. (Type locality, Red Sea).

3 specimens. 150 - 320 mm. Onotoa.

Scarus javanicus

Scarus javanicus Bleeker 1854. Nat. Tijdschr. Ned. Indië, vol. 6, p. 198. (Type locality, Java).

No specimens were taken. Large parrot-fish were seen on the outer coralliferous terrace which may have been this species. They appeared gray underwater, with the posterior half of the body abruptly paler than the anterior half.

Scarus formosus

Scarus formosus Cuvier and Valenciennes 1839. Hist. nat. poiss., vol. 14, p. 283. (Type locality, Hawaiian Islands).

1 specimen. 160 mm. Butaritari.

Scarus schlegeli

Pseudoscarus schlegeli Bleeker 1861. Verslag. Akad. Wet. Amsterdam, vol. 12, p. 242. (Type locality, Celebes).

1 specimen. 180 mm. Onotoa.

Scarus forsteri

Scarus forsteri Cuvier and Valenciennes 1839. Hist. nat. poiss., vol. 14, p. 275. (Type locality, Tahiti).

1 specimen. 96 mm. Onotoa.

Scarus globiceps

Scarus globiceps Cuvier and Valenciennes 1839. Hist. nat. poiss., vol. 14, p. 242. (Type locality, Tahiti).

1 specimen. 170 mm. Onotoa.

1 specimen. 240 mm. Butaritari.

Scarus brevifilis

Pseudoscarus brevifilis Günther 1909. Jour. Mus. Godeffroy, vol. 6, pt. 16, p. 327, pl. 161. (Type locality, Tahiti and Abemama, Gilbert Islands).

7 specimens. 23 - 225 mm. Onotoa.

Scarus lepidus

Scarus lepidus Jenyns 1842. Zool. voyage "Beagle", pt. 4, Fish, p. 108. (Type locality, Tahiti).

Callyodon laxtoni Whitley. 1948. Rec. Australian Mus., vol. 22, p. 94. (Ocean Island).

Scarus vermiculatus

Callyodon vermiculatus Fowler and Bean 1928. Bull. U. S. Nat. Mus. 100, vol. 7, p. 472, pl. 49. (Type locality, Philippine Islands).

2 specimens. 65 and 240 mm. Onotoa.

Scarus chlorodon

Scarus chlorodon Jenyns 1842. Zool. voyage "Beagle", pt. 4, Fish, p. 105, pl. 21. (Type locality, Keeling Island, Indian Ocean).

Pseudoscarus altipinnis Günther 1909. Jour. Mus. Godeffroy, vol. 6, pt. 16, p. 326, pl. 160. (Kingsmill Islands).

3 specimens. 150 - 205 mm. Onotoa.

1 specimen. 260 mm. Butaritari.

Scarus oviceps

Scarus oviceps Cuvier and Valenciennes 1839. Hist. nat. poiss., vol. 14, p. 244. (Type locality, Tahiti).

4 specimens. 128 - 220 mm. Onotoa.

Scarus niger

Scarus niger Forskål 1775. Descr. animalium, pp. x, 28. (Type locality, Red Sea).

3 specimens. 135 - 200 mm. Onotoa.

Scarus aeruginosus

Scarus aeruginosus Cuvier and Valenciennes 1839. Hist. nat. poiss., vol. 14, p. 257. (Type locality, Red Sea).

2 specimens. 129 and 134 mm. Onotoa.

Scarus pectoralis

Scarus pectoralis Cuvier and Valenciennes 1839. Hist. nat. poiss., vol. 14, p. 269. (Type locality, Djedda, Red Sea).

2 specimens. 150 and 230 mm. Onotoa.

1 specimen. 160 mm. Butaritari.

Scarus dussumieri

Scarus dussumieri Cuvier and Valenciennes 1839. Hist. nat. poiss., vol. 14, p. 252. (Type locality, Seychelles).

2 specimens. 250 and 300 mm. Onotoa.

Scarus taeniurus

Scarus taeniurus Cuvier and Valenciennes. 1839. Hist. nat. poiss., vol. 14, p. 257. (Type locality, Mauritius).

2 specimens. 78 and 87 mm. Onotoa.

Scarus ghobban

Scarus ghobban Forskål 1775. Descr. animalium, p. 28. (Type locality, Red Sea).

Pseudoscarus garretti Günther 1909. Jour. Mus. Godeffroy, vol. 6, pt. 16, p. 306, pl. 153, fig. C. (Type locality, Kingsmill Islands).

4 specimens. 160 - 190 mm. Onotoa.

Scarus sp.

This is a reddish brown parrot-fish with longitudinal lines on the body, red fins, and a pale caudal peduncle which will be described as new by L. P. Schultz.

Genus CHLORURUS

Chlorurus Swainson 1839. Nat. hist. class. fishes, amphibians,..., vol. 2, p. 227. (Type species, *Scarus gibbus*).

Chlorurus gibbus

Scarus gibbus Rüppell 1828. Atlas Reise nördlichen Afrika, p. 81, pl. 20, fig. 2. (Type locality, Red Sea).

A school of over 20 very large parrot-fishes with tremendously swollen foreheads was observed at the west reef at Onotoa. From my description Dr. Schultz believes that these were *gibbus*.

Chlorurus bicolor

Chlorurus bicolor Rüppell 1828. Atlas Reise nördlichen Afrika, p. 82, pl. 21. (Type locality, Djedda, Red Sea).

Although this species was seen on numerous occasions, no specimens were taken. A close-range spearing attempt resulted in the securing of a single scale from a large adult.

Family KYPHOSIDAE

No kyphosids were collected in the Gilbert Islands by the author; however, unidentified individuals of the genus *Kyphosus* were occasionally seen underwater.

I follow Fowler (1928: 221) in considering *Pachymetopon squamosum* Alleyne and Macleay as a synonym of *Kyphosus cinerascens* Forskål.

Genus KYPHOSUS

Kyphosus Lacépède 1802. Hist. nat. poiss., vol. 3, p. 114. (Type species, *Kyphosus bigibbus* Lacépède = *Kyster fuscus* Lacépède).

Kyphosus cinerascens

Sciaena cinerascens Forskål 1775. Descr. animalium, pp. xii, 53. (Type locality, Arabia).

Opisthistius squamosus Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 293. (Nauru).

Family CHAETODONTIDAE

The butterfly and angel fishes need no introduction. With their striking color patterns and high compressed bodies, they are well known to all. They were very conspicuous on Gilbert Islands reefs, especially the species with bright yellow color. One wonders at the survival value of such color which so attracts the eye. To my knowledge it does not advertise poisonous spines or distasteful qualities (at least to man). Some authors such as Norman (1931: 212) have stressed the role of disruptive coloration in the black bands and spots that are so often present in Chaetodon. These markings may be operative in this way for some marine predators, but I have never found myself nearly overlooking a chaetodont on this basis. I believe that the bright color and distinctive markings function more for species recognition, not just in chaetodonts, but in reef fishes of tropic seas in general. This I infer from the great multiplicity of species and from the clear water which enhances the use of visual stimuli in species recognition. Also, fishes of the reef areas are provided with excellent cover in the many interstices in the coral, and the need for blending with the surroundings to escape notice of roving predators is not such a keen one. Under such circumstances selection against bright color pattern is lessened.

Some species of butterfly fishes such as Chaetodon auriga employ a mode of swimming by which they may avoid detection. They angle their bodies toward a potential danger, displaying them in narrow dorsal aspect.

The high body and array of stout dorsal and anal spines of these fishes is probably of considerable importance in their escaping predation.

At Onotoa the Gilbertese referred to nearly all the species of Chaetodon by the one name Teibaba.

Subfamily CHAETODONTINAE

Included in this grouping are the butterfly fishes, distinguished from the angel fishes primarily by lacking the long stout spine near the angle of the preopercle.

Although observed in nearly all habitats, the butterfly fishes were no where abundant. They were usually seen singly or in pairs.

Genus CHAETODON

Chaetodon Linnaeus 1758. Syst. nat., ed. 10, vol. 1, p. 272. (Type species, Chaetodon capistratus Linnaeus).

Chaetodon auriga

Chaetodon auriga Forskål 1775. Descr. animalium, pp. xiii, 60. (Type locality, Red Sea).

Chaetodon setifer Kendall and Goldsborough 1911. Mem. Mus. Comp. Zoöl., vol. 26, p. 306. (Butaritari).

2 specimens. 90 and 125 mm. 12 specimens. 22 - 25 mm. Onotoa.

D XIII, 22 to 24; A III, 19 or 20; P 16. (2 specimens)

Color in life white, yellow-orange posteriorly and on soft dorsal and anal fins; a broad vertical black bar through eye; a large black spot in outer part of soft dorsal fin adjacent to ray which extends as a filament; 5 diagonal black lines running from opercle toward spinous dorsal; about 9 similar parallel lines perpendicular to the first set and running across chest and side of body to base of anal fin; a brownish region dorsally between yellow and white coloration of body in which there are yellow lines paralleling both sets of black lines as described.

This was the most abundant species in the Onotoa lagoon.

Chaetodon ephippium

Chaetodon ephippium Cuvier and Valenciennes 1831. Hist. nat. poiss., vol. 7, p. 80, pl. 174. (Type locality, Moluccas and Society Islands).

1 specimen. 135 mm. 3 specimens. 19 - 36 mm. Onotoa.

D XIII, 23; A III, 20; P 16. (1 specimen).

Color from 35 mm Kodachrome transparency light gray with a large purplish black area on back and dorsal fin posterior to 6th dorsal spine, this area broadly bordered ventrally in white; tip of snout and a broad region ventrally on chest to origin of pelvic fins orange; about 6 lengthwise purplish lines on lower half of side of body; caudal fin purplish hyaline with upper and lower lobes narrowly yellow and base reddish orange; a band of yellow and red-orange in outer part of soft dorsal fin running from base of filament to axil of soft dorsal; anal fin white with a broad yellow marginal and a reddish submarginal band; pelvics yellow.

This species was seen only in the lagoon at Onotoa.

Chaetodon lineolatus

Chaetodon lineolatus Cuvier and Valenciennes 1831. Hist. nat. poiss., vol. 7, p. 40. (Type locality, Mauritius).

Chaetodon lineolatus Günther 1873. Jour. Mus. Godeffroy, vol. 2, pt. 3, p. 45, pl. 34, fig. A. (Kingsmill Islands).

Chaetodon vagabundus

Chaetodon vagabundus Linnaeus 1758. Syst. nat., ed. 10, p. 276. (Type locality, Indies).

3 specimens. 105 - 115 mm. 4 specimens. 22 - 25 mm. Onotoa.

2 specimens. 97 and 107 mm. Tarawa.

D XIII, 24 or 25; A III, 19 or 20; P 16. (3 specimens).

Color from 35 mm Kodachrome transparency white, dusky white posteriorly, with a vertical black bar extending from nape through eye to isthmus; a black line at base of spinous dorsal, broadening into a band at base of soft dorsal, and continuing across base of caudal fin on to anal fin; 6 diagonal narrow black lines running from upper part of head toward spinous dorsal fin; 12 similar lines perpendicular to first set running across body toward anal fin and base of caudal fin; soft dorsal fin yellow with a broad black margin; anal fin yellow with a pale margin and a black submarginal line; caudal fin yellow (except narrow margin which is hyaline) with 2 vertical black bars, the outer one narrow and submarginal to hyaline outer part of fin.

C. vagabundus was taken only in the lagoon. It was more characteristic of areas of rich coral growth than auriga or ephippium which seem to prefer sandy regions with little coral.

Chaetodon ornatissimus

Chaetodon ornatissimus Cuvier and Valenciennes 1831. Hist. nat. poiss., vol. 7, p. 22. (Type locality, Tahiti).

1 specimen. 115 mm. Onotoa.

1 specimen. 145 mm. Tarawa.

D XII, 25; A III, 21; P 17. (1 specimen).

Color from 35 mm Kodachrome transparency white with 6 prominent diagonal orange bands crossing body, the most ventral nearly parallel with base of anal fin; head and nape yellow; a vertical black band through eye; a vertical black line just behind eye extending as a submarginal line into the dorsal fin, meeting at its terminus the fourth orange body band; a vertical black line on snout; lower lip black; a dusky orange vertical line on operculum; caudal fin with basal half white, then a black band, a broad yellowish area, and a black margin.

The species was only sighted on two occasions, each time on the coralliferous terrace of the outer reef.

Chaetodon meyeri

Chaetodon meyeri Bloch and Schneider 1801. Systema ichth., p. 233. (Type locality, Moluccas).

6 specimens. 32 - 130 mm. Onotoa.

D XII, 24 or 25; A III, 20 or 21; P 17. (4 specimens).

Color from 35 mm Kodachrome transparency white with long curving black bands as follows: one beginning as a submarginal band near end of soft dorsal fin, leaving fin at level of 4th dorsal spine and sweeping across operculum and chest to base of anal fin; a second beginning dorsally near base of caudal fin, extending to base of pectoral fin, up to spinous dorsal, and curving back to pectoral base; third and fourth beginning beneath pectoral fin, running diagonally back to soft dorsal, and curving forward on this fin; a yellow-margined, vertical, black bar through eye; all fins yellow, median fins with black bands; a row of orange dots in soft dorsal, several rows dorso-anteriorly on body, and 2 narrow, vertical, orange lines in caudal fin.

This striking species was taken both in the lagoon and in outer reef areas, but always in regions of high coral cover.

Chaetodon falcula

Chaetodon falcula Bloch 1793. Natur. ausländ. Fische, pt. 7, p. 102, pl. 325, fig. 2.

3 specimens. 103 - 111 mm. 1 specimen. 38 mm. Onotoa.

D XII, 24; A III, 20; P 15 or 16. (3 specimens).

Color from 35 mm Kodachrome transparency dusky white, yellow posteriorly, with 2 large vertical blackish areas on side and extending on to dorsal fin, the first just behind head, the second adjacent to yellow color of posterior part of body; about 17 vertical black lines on body, more apparent in whitish area between the two blackish areas; a vertical black band crossing head and passing through eye; a black spot at base of caudal fin; median fins yellow, caudal with edge hyaline and a submarginal black line; indistinct submarginal black lines in dorsal and anal; pelvic fins white; pectorals hyaline.

All of the specimens were collected in the lagoon around coral heads.

Chaetodon kleini

Chaetodon kleinii Bloch 1790. Natur. ausländ. Fische, pt. 4, p. 7, pl. 218, fig. 2. (Type locality, East Indies).

4 specimens. 36 - 80 mm. Onotoa.

D XIII, 21 or 22; A III, 19; P 15. (4 specimens).

Color in life of 80 mm specimen dusky yellowish on anterior half of body, dull orange posteriorly and on dorsal and anal fins; a vertical black band running from nape across head through eye and curving across chest to pelvic fins which are dark; 2 indistinct broad vertical brown areas, the first just behind head, the second at front of posterior orange part of body; caudal fin yellow with a white band at base, outer one-fourth hyaline; posterior part of soft dorsal and soft anal fins with narrow hyaline margin and a narrow black submarginal line; tip of snout black.

A rare species, C. kleini was taken in only two localities, one in the lagoon in 18 feet of water near a large coral head and the other on the outer reef on the lee side.

Chaetodon bennenti

Chaetodon Bennetti Cuvier and Valenciennes 1831. Hist. nat. poiss., vol. 7, p. 84. (Type locality, Sumatra).

5 specimens. 79 - 120 mm. Onotoa.

D XIV, 17 or 18; A III, 16; P 16 or 17 (mostly 16). (5 specimens).

Color from 35 mm Kodachrome transparency yellow with a large round black spot rimmed in blue on the back just posterior to midpoint of body; area around this black spot dusky; two bright blue bands originating on opercle and passing posteriorly and ventrally on body; a blackish blue-bordered band running from nape across head through eye.

Chaetodon bennenti was found in all major regions of the atoll, but was not common in any.

Chaetodon quadrimaculatus

Chaetodon quadrimaculatus Gray 1833. Zool. Misc., p. 33. (Type locality, Hawaiian Islands).

1 specimen. 38 mm. Onotoa.

D XIV, 21; A III, 16; P 16.

Color in alcohol: body dark brown on dorsal half, pale yellowish (yellow in life) ventrally; a round pale (white in life) spot on middle of back just above lateral line; a second pale area (also white in life on back, half way from pale spot to base of caudal fin (this area confluent with pale yellowish of lower half of body); head pale with a black bordered band (recalled as orange in life) running from origin of dorsal through eye to lower edge of operculum; caudal fin and posterior parts of soft dorsal and anal fins pale; pelvic fins pale; pectoral fins hyaline.

The single small specimen was the only one seen at Onotoa. It was speared close inshore off the small island of Aunteuma in the northern part of the atoll.

Chaetodon lunula

Pomacentrus lunula Lacépède 1802. Hist. nat. poiss., vol. 4, pp. 507, 511, 513.

2 specimens. 62 and 129 mm. 7 specimens. 19 - 22 mm. Onotoa.

D XII, 24 or 25; A III, 18; P 16. (2 specimens).

Color from 35 mm Kodachrome transparency of 62 mm specimen: dorsal half of body and base of dorsal fin blackish purple; ventral half of body dirty yellow; head pale with a vertical black band through eye; adjacent and posterior to this, a broad white band; a broad black band bordered with yellow narrowing as it passes to middle of base of spinous dorsal fin; a large black area on caudal peduncle edged in bright yellow; a black spot in middle base of soft dorsal fin with a yellow line running from its base to yellow area at front of black area on caudal peduncle; basal half of caudal fin yellow, outer half clear, these two r regions separated by a narrow black band; dorsal fin with a distinct black marginal band, yellow submarginally; anal fin yellow with a narrow black margin; pelvics yellowish; pectorals yellowish-hyaline; faint diagonal lines on body.

This well-known species was seen in many atoll environments, but most commonly in the lagoon.

Chaetodon trifasciatus

Chaetodon trifasciatus Mungo Park 1797. Trans. Linn. Soc. London, vol. 3, p. 34. (Type locality, Sumatra).

10 specimens. 22 - 97 mm. Onotoa.

D XIII, 21 or 22 (mostly 21); A III, 19 or 20; P 15. (5 specimens).

Color from 35 mm Kodachrome transparency tan dorsally shading to orange-yellow ventrally with about 14 narrow, slightly curved, lengthwise, purplish lines on side of body; a black bar, edged in bright orange-yellow, on head passing through eye; posterior and adjacent to this a narrow white and a narrow black band; end of snout black; basal part of spinous dorsal with many narrow lines such as appear on body; outer membranes of spinous dorsal whitish; soft dorsal with 4 lengthwise bands of about equal width, a light dusky outer band, a white band narrowly edged in black, a yellowish band, and a black basal band (broader posteriorly and edged in yellow); base of anal soft fin bluish, then a broad white line, a black band, a narrow bright yellow line, a broad blackish area, and a narrow whitish margin; anal spines dusky orange; caudal peduncle bluish with a black spot dorsally (in line with black band at base of soft dorsal); caudal fin white on base, followed by a vertical black band, a narrow yellowish line, and outer one-third hyaline; pelvic fins yellow; pectorals hyaline.

A very omnipresent chaetodont, this species was probably the most abundant generally at Onotoa.

The stomach contents of 7 adult specimens were examined. They consisted primarily of green algae.

Chaetodon reticulatus

Chaetodon reticulatus Cuvier and Valenciennes 1831. Hist. nat. poiss., vol. 7, p. 32, pl. 171. (Type locality, Tahiti, and Ulea = Woleai, Caroline Islands).

This distinctive species was seen at Onotoa, but no specimens were taken.

Genus MEGAPROTODON

Megaprotodon Guichenot 1848. Rev. Zool., vol. 11, p. 12. (Type species, Chaetodon bifasciatus Cuvier and Valenciennes).

Megaprotodon strigangulus

Chaetodon strigangulus Gmelin 1788. Syst. nat., ed. 13, p. 1269.

2 specimens. 54 and 140 mm. Onotoa lagoon.

D XIV, 15; A IV 14 or 15; P 15. (2 specimens).

Color from 35 mm Kodachrome of large specimen white with about 14 "V"-shaped lines on side of body, the bottom of each V pointing forward about in mid-line of body (posteriorly there are more dorsal limbs of the V's than ventral); a black band, bordered in yellow, running from nape through eye to isthmus; caudal fin black with upper and lower margins narrowly yellow, a black posterior margin, and a yellow submarginal band; dorsal fin orange-yellow with a very narrow black margin posteriorly; anal fin pale yellowish with a narrow black margin over ends of soft rays; pelvic fins white; pectoral fins hyaline with a yellowish spot at upper edge of base.

The 54 mm specimen has a large black crescent-shaped area (preceded by a pale band) on hind part of body, posterior part of dorsal and anal fins, and base of caudal fin; posterior to this in the caudal fin is a pale triangular area with a black line at its base which is submarginal to outer hyaline part of fin.

Genus HENIOCHUS

Heniochus Cuvier 1817. Règne animal, ed. 1, vol. 2, p. 335. (Type species, Chaetodon macrolepidotus Bloch).

Heniochus permutatus

Heniochus permutatus Cuvier and Valenciennes 1831. Hist. nat. poiss., vol. 77, p. 99.

2 specimens. 118 and 127 mm. 6 specimens. 36 - 42 mm. Onotoa.

D XIII, 22 or 23; A III, 17 or 18; P 15. (4 specimens).

Color of 42 mm juvenile specimen from 35 mm Kodachrome transparency white with 3 diagonal black bands on body, the first running from nape across head to pelvic region, the second from the 3rd to 9th dorsal spines (and extending out on long filament of 4th dorsal spine) to the soft anal fin, and the third (a narrower band) at base of soft dorsal; a pale-rimmed, black spot in soft anal fin; caudal fin hyaline with a black spot at base of upper rays; pelvic fins black; pectoral fins hyaline; snout yellow.

The young were taken from tidepools on the outer reef flat and in shallow lagoon or channel waters. The two adults were poisoned with rotenone from a protected outer reef area with numerous coral heads.

Heniochus acuminatus

Chaetodon acuminatus Linnaeus 1758. Syst. nat., ed. 10, p. 272. (Type locality, Indies).

24 specimens. 25 - 46 mm. Onotoa.

D XI, 25 or 26; A III, 18 or 19; P 17 or 18. (5 specimens).

Color in alcohol white with 2 broad diagonal black bands on body, the first from anterior part of dorsal fin to pelvic fins (and including them), the second from 5th to 11th dorsal spines to posterior half of anal fin. The membraneous filament of the 4th dorsal spine of this species (not well developed in the smaller specimens) is white.

Only juveniles were collected, all from shallow-water lagoon areas.

Heniochus varius

Taurichthys varius Cuvier 1829. Règne animal, ed. 2, vol. 2, p. 192. (Type locality, East Indies).

3 specimens. 33 - 42 mm. Onotoa.

D XI, 23 or 24; A III, 17 or 18; P 15. (3 specimens).

Color of 42 mm specimen from 35 mm Kodachrome transparency dark brown with a white band running from origin of dorsal fin across posterior part of head to chest and another one running diagonally from posterior part of spinous dorsal to caudal peduncle; outer portion of soft dorsal fin and all of caudal fin and pectoral fins hyaline; pelvic and anal fins dark brown; numerous, pale, lengthwise lines faintly visible on body.

All specimens were taken from around coral heads in the lagoon. One was speared by D. W. Strasburg.

Subfamily POMACANTHINAE

Genus POMACANTHUS

Pomacanthus Lacépède 1802. Hist. nat. poiss., vol. 4, p. 517. (Type species, Chaetodon arcuatus Linnaeus, as restricted by Cuvier).

Pomacanthus imperator

Chaetodon imperator Bloch 1787. Natur. ausländ. Fische, vol. 3, p. 51, pl. 174. (Type locality, Japan).

Pomacanthoides imperator Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 293. (Nauru).

Genus CENTROPYGE

Centropyge Kaup 1860. Arch. Naturg., vol. 26, pt. 1, p. 140 (Type species, Centropyge tibicen Kaup).

Centropyge flavissimus

Holocanthus flavissimus Cuvier and Valenciennes 1831. Hist. nat. poiss., vol. 7, p. 197. (Type locality, Ulea = Woleai, Caroline Islands).

3 specimens. 74 - 100 mm. Onotoa.

D XIV, 15 or 16; A III, 16; P 16 or 17. (3 specimens).

Color from 35 mm Kodachrome transparency bright yellow with a blue ring around the eye; edge of opercle light blue with extreme margin above base of pectoral black; spines at corner and lower limb of preopercle light blue; soft dorsal, soft anal, and caudal fins with a narrow pale blue margin and a thin black submarginal line.

The species was taken on the outer reef or in the lagoon where coral was abundant. It is the most common angel fish at Onotoa.

Centropyge bicolor

Chaetodon bicolor Bloch 1787. Nat. ausländ. Fische, pt. 3, p. 94, pl. 206, fig. 1. (Type locality, East Indies).

Holacanthus bicolor Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 261. (Kingsmill Islands).

A small, bright yellow angel fish with broad blue bars was sighted at a depth of about 25 feet in the Onotoa lagoon near a coral knoll. It was probably this species.

Genus PYGOPLITES

Pygoplites Fraser-Brunner 1933. Proc. Zool. Soc. London, p. 587. (Type species, Chaetodon diacanthus Boddaert).

Pygoplites diacanthus

Chaetodon diacanthus Boddaert 1772. Epistola...de Chaetodonte diacantho descripto, p. 19. (Type locality, Ambon, East Indies).

1 specimen. 140 mm. Onotoa.

1 specimen. 131 mm. Tarawa.

D XIV, 19; A III, 19; P 16. (1 specimen).

Color from 35 mm Kodachrome transparency: body with alternate bars of blue and orange (the blue dark with pale centers) which extend on to and curve backwards on dorsal and anal fins; caudal fin bright yellow; head and chest purplish; 2 vertical blue lines running from nape to eye; margin of opercle and margin of preopercle with a blue line; spine at corner of preopercle blue; mouth orange-yellow; pelvic fins orange; pectoral fins hyaline-yellow.

The Onotoa specimen was speared near a coral head in the lagoon.

Family EPHIPPIDAE

Genus PLATAX

Platax Cuvier 1817. Règne animal, ed. 1, vol. 2, p. 334. (Type species, Chaetodon tiera Bloch)

Platax orbicularis

Chaetodon orbicularis Forskål 1775. Descr. animalium, p. 59. (Type locality, Red Sea).

1 specimen. 88 mm. Tarawa.

D V,35; A III, 25; P 18.

Teeth as in Fig. 49 b and body shape as in Fig. 51 (left) of Weber and de Beaufort (1936).

Family ZANCLIDAE

Genus ZANCLUS

Zanclus Cuvier and Valenciennes 1831. Hist. nat. poiss., vol. 7, p. 102. (Type species, *Chaetodon cornutus* Linnaeus).

Zanclus cornutus

Chaetodon cornutus Linnaeus 1758. Syst. nat., ed. 10, p. 273. (Type locality, Indies).

Chaetodon canescens Linnaeus 1758. Syst. nat., ed. 10, p. 215.

Zanclus cornutus Günther 1876. Jour. Mus. Godeffroy, vol. 5, pt. 11, p. 142, pl. 92.

Zanclus canescens Herre 1927. Philip. Jour. Sci., vol. 34, p. 472, pl. 8.

Zanclus cornutus Herre, ibid, p. 473, pls. 9, 10.

Zanclus cornutus Weber and de Beaufort 1936. Fishes Indo-Austral. Arch., vol. 7, p. 170, fig. 44.

Zanclus canescens Weber and de Beaufort, ibid, p. 172, fig. 45.

Zanclus cornutus Woods *in* Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, p. 610, pl. 50, A.

Zanclus canescens Woods, ibid, p. 612, pl. 60.

4 specimens. 57 - 130 mm. Onotoa.

D VII,40 to 42; A III,34 or 35; P 18 or 19. (3 specimens).

Color from 35 mm Kodachrome transparency of 130 mm specimen: body white and yellow with a very broad black region from origin of dorsal and nape, enclosing eye and base of pectoral fin, and broadening ventrally on chest and abdomen; a broad black band on posterior part of body extending into soft dorsal and soft anal fins (this area followed by a narrow white and a narrow black line); caudal peduncle and posterior part of soft dorsal and anal fins yellow; caudal fin black with a white margin and a white diagonal line at base; snout white with a black-edged, orange saddle-like mark dorsally; lower lip and outer half of chin black; pectoral fins hyaline with dusky rays; pelvic fins black.

Specimens were taken from both the lagoon and outer reef. The stomach contents of two adult specimens were examined and found to be mostly algal. A small amount of bottom sediment had also been ingested.

There has been a long-standing controversy as to whether Zanclus canescens Linnaeus is the young of Zanclus cornutus Linnaeus or whether the two are valid species. The consensus of recent works favors the latter opinion. Weber and de Beaufort (1936: 173) have reviewed the problem in detail. Although these authors admit that canescens is probably of a more pelagic habit and no specimens above 80 mm in length (apparently total length) are known, they prefer to recognize both species.

I have examined Zanclus in the collections of the United States National Museum, Stanford Natural History Museum, California Academy of Sciences, Bishop Museum, and University of Hawaii. All of the large specimens are cornutus. Those specimens with a prominent preorbital spine just above and slightly posterior to the rictus (canescens of some authors) were all small, the largest being 63 mm in standard length. Some specimens of typical cornutus were as small as 52 mm. In my opinion canescens is the late post larval stage of cornutus, and the size at transformation from the canescens form to the juvenile cornutus is variable as has been demonstrated for various species of surgeon fishes (Breder, Copeia, 1949: 296) (Randall, MS).

Although specimens were found which were variously intermediate in color between the pale (probably transparent in life) canescens with silvery abdomen and the black-banded cornutus, none were seen with the preorbital spine undergoing gradual resorption as was expected. Two specimens at the California Academy of Sciences (No. 7162), 52 and 54 mm in standard length, provide a possible answer to this enigma. Although traces of silvery color are still present on the abdomen of these specimens, and the broad vertical bars are not intensely black, the spine on each side of both is completely gone. At its site is a slightly depressed area of exposed preorbital bone about the size of the base of the spine. The epidermis at the margin of this area is free and jagged. This suggests that the preorbital spine may be shed as a unit during transformation. It seems unlikely that the spine on both sides of the two specimens would have been torn off during or subsequent to their capture. Confirmation of the hypothesis that the spine is shed could be most convincingly obtained by placing a live canescens in an aquarium and observing the postulated transformation into cornutus.

I examined the 63 mm specimen reported by Woods in Schultz and collaborators (1953: 612, pl. 60) as Z. canescens. It was taken at the entrance to a channel to Bikini Atoll by night lighting, and it still shows the silver coloration over the abdomen. On recounting the fin rays, I find that there are 33 soft rays in the anal fin instead of 32. The 57 mm specimen from Onotoa is a late canescens form with the preorbital spine. Its fin ray counts are D VII,42; A III,35, well within the range given by Woods for *cornutus*; thus the apparent separation of *canescens* and *cornutus* by fin ray counts as tabulated by this author is probably not valid. It resulted from his two specimens of *canescens* being, by chance, ones with low counts.

To my knowledge, Günther (1876: 142) was the first to indicate that *Z. canescens* is the young of *Z. cornutus*. He used only the name *cornutus*; therefore this name is preferred in spite of the page priority of *canescens*.

The pair of supraorbital horns that are deemed characteristic of *cornutus* were not seen on any small examples of *Zanclus*. Some specimens as large as 120 mm in standard length lacked these bony prominences; others as small as about 90 mm had them at least partly formed. Good-sized adult specimens generally showed either well-developed horns or short nubbins. Fifteen such specimens were sexed. Seven had large horns and were all males; the remaining eight had short horns and were females. A 128 mm male from the Philippines had horns which exceeded in length the diameter of the pupil of the eye. The horn length (measured from tip to base where head squamation appears) of a 130 mm female taken in the Gilbert Islands was contained about 4 times in the diameter of the pupil.

It is suspected that the variability in length of fish at which horns develop is also a manifestation of sexual differences, the males forming their horns sooner. This could not be demonstrated because of the difficulty in determining the sex of subadult specimens that have been in preservative for many years.

Family ACANTHURIDAE

The surgeon fishes are well known for their herbivorous food habits and the possession of defensive apparatus in the form of a single folding spine or a pair of fixed, keel-like spines on each side of the caudal peduncle. At Onotoa they were the most abundant family of fishes of their size on the reefs. Some species such as *Acanthurus mata*, *A. bleekeri*, *A. pyroferus* (= *celebicus*) and certain of the *Naso* were not seen or taken in the Gilbert Islands but probably occur there. Fowler (1928: 270) recorded *Acanthurus dussumieri* (as *Hepatus bariene*) from the Kingsmill Islands. In view of the known distribution of this species (Randall, in press), this record should be checked.

An intersting zonation of different species of acanthurids was observed on the outer sea reef at Onotoa. In inshore reef areas, exposed as tide pools at low tide, the young of *Acanthurus triostegus* were very abundant. Farther seaward but still on the reef flat the adults of *A. triostegus* were the dominant surgeon fishes. In the surge channels three species of *Acanthurus* were commonly seen. *A. guttatus* was observed in small schools in the highly turbulent water toward the apices of the surge channels. *A. achilles* was occasionally seen in the same area but seemed to prefer less turbulent surge channel water to seaward. The colorful *A. lineatus* occurred throughout the surge channels but predominated in the broad outer parts as they opened on to the coralliferous terrace. *A. glaucopareius* and *Ctenochaetus striatus* were especially abundant in the latter zone.

Key to the Species of Acanthuridae Recorded from the Gilbert Islands

1a. Caudal peduncle armed on each side either with 2 sharp, laterally-projecting, fixed spines or a pair of small bony protuberances; dorsal spines V to VII (usually VI or VII) anal spines II; pelvic fin rays I,3; teeth conical or almost so, without denticulations or with very slight marginal serration; least depth of caudal peduncle contained 3.5 to 6 times in head length; a prominent bump or horn often present on forehead.....2

1b. Caudal peduncle armed on each side with a single, sharp, folding spine, fitting into a horizontal groove in side of body; dorsal spines IV, V, VIII, or IX; anal spines III; pelvic fin rays I,3 or I,5; teeth flattened, always with prominent marginal denticulations; least depth of caudal peduncle contained 2.1 - 3.5 in head length; a prominent bump or horn never present on forehead..6

2a. Caudal peduncle spines and broad area surrounding each spine pale (orange in life) and in sharp contrast to dark brown color of rest of body; no horn or bony prominence present on forehead; a distinct pale (yellow in life) line running dorsally from rictus and curving posteriorly to eye; margin of preopercle pale...............................*Naso lituratus*

2b. Caudal peduncle spines or protuberances and surrounding area not distinctly paler than rest of body; a conspicuous horn or rounded bony eminance present on forehead of adults; color not as in 2a...........3

3a. A horn-like protuberance on forehead of adults.........4

3b. A prominent hump on forehead of adults.................5

4a. Base of rostral horn posterior to rictus; body (except in acronurus or keris stage which is spotted) without spots or vertical lines; caudal spines surrounded by blackish areas (blue in life); teeth without small denticulations (though teeth at sides of jaw may show faint marginal serration); pectoral rays 17 or 18 (all elements counted).................*Naso unicornis*

4b. Base of rostral horn anterior to rictus; body faintly marked with indistinct vertical dark lines, ventrally with spots; no blackish areas around caudal spines; margins of teeth with small denticulations; pectoral rays 15 or 16 (all elements counted)... *Naso brevirostris*

5a. Side of body without numerous long vertical dark lines; head, dorsal 2/3 of body, and caudal fin with many small black spots; dorsal and anal fins not elevated, length of last dorsal spine contained more than 2 times in length of snout; caudal spines (at least in specimens as large as 250 mm in standard length) not long and blade-like with tips curved forward; caudal fin without long narrow filaments.. *Naso tuberosus*

5b. Side of body with numerous long vertical dark lines; back, head, chest, and abdomen with small dark spots; dorsal and anal fins elevated, length of last dorsal spine about equal to length of snout; caudal spines of adults long and blade-like with tips curved forward (similar to *lituratus* and *unicornis*); caudal fin may have long, narrow, posterior filaments, one from the upper and one from the lower lobe.. *Naso vlamingi*

6a. Pelvic fin rays I, 3; soft dorsal rays 18 to 20; scales on head broad and tuberculated; a broad black area on back enclosing an oval grayish (blue in life) region at tip of pectoral fin; a long yellowish triangle (yellow in life) with apex anterior to caudal spine and base formed by truncate posterior margin of caudal fin; upper and lower lobes of caudal fin black, this color continuous with black on back; rest of body grayish (blue in life)...*Paracanthurus hepatus*

6b. Pelvic fin rays I, 5; soft dorsal rays 22 to 33; scales on head not broad and tuberculated; color not as in 6a...7

7a. Dorsal spines IV or V; dorsal and anal fins elevated, the first soft ray of the dorsal fin contained 2.0 to 3.7 times in the standard length; snout markedly produced..8

7b. Dorsal spines VIII or IX; dorsal and anal fins not elevated, the first soft ray of dorsal fin contained 4.5 to 7.5 in standard length; snout not markedly produced..9

8a. Dorsal soft rays 30 to 33; anal soft rays 24 to 26; dorsal and anal fins extremely elevated, the first soft ray of dorsal fin 2.0 to 2.3 in standard length (1.8 in a 25 mm juvenile specimen); body with alternating pale and dark vertical bands...*Zebrasoma veliferum*

8b. Dorsal soft rays 23 to 25; anal soft rays 19 to 21; dorsal and anal fins moderately elevated, the first soft ray of dorsal fin 2.7 to 3.7 in standard length (2.2 in a 32 mm juvenile specimen); body of adults brown with faint, pale, narrow, longitudinal lines (juveniles with narrow vertical pale lines and small spots)......................*Zebrasoma scopas*

9a. Teeth very elongate, freely-movable, and numerous (varying from 20 in the upper jaw of a 37 mm specimen of *C. striatus* to 42 in a 130 mm specimen), the tips expanded, incurved, and bearing lateral denticulations; dorsal spines VIII........................22

9b. Teeth not very elongate, not movable, and not numerous (not exceeding 22 in upper jaw of largest adults), flattened, and denticulated on entire margin; dorsal spines IX (rarely VIII)..............................10

10a. Body light gray with 6 vertical black bars (1 on head passing through eye, 4 on body, and 1 on caudal peduncle); anal soft rays 19 to 21; caudal peduncle spine very small, its greatest length contained about 3 to 4 times in greatest diameter of eye...*Acanthurus triostegus*

10b. Body not light gray with vertical black bars; anal soft rays 22 or more; caudal peduncle spine not very small, its length contained 1.5 times or less in greatest diameter of eye...........................11

11a. Posterior half of body and dorsal and anal fins with numerous white spots on a dark brown background; body with 3 broad vertical pale bands; body very deep, greatest depth contained 1.5 - 1.6 times in standard length.......................*Acanthurus guttatus*

11b. Posterior half of body and dorsal and anal fins without white spots; body without 3 broad vertical pale bands; body not very deep, greatest depth contained 1.7 - 2.2 times in standard length.......................12

12a. Upper 3/4 of body lined with about 10 black bands, each containing a median pale line (blue in life), running nearly horizontally (many of these bands continue on to head and converge on eye); spaces between bands pale (yellow in life); caudal spine very long, about 1.9 to 2 in head length...........*Acanthurus lineatus*

12b. Upper 3/4 of body not lined with about 10 nearly horizontal black bands containing median pale lines; caudal spine not very long, about 2.5 to 8 in head length....................................13

13a. Body very dark brown or black with a white line under chin and a pale line or band at the base of the dorsal and anal fins; mouth very small, its width from rictus to rictus contained 5 to 6 times in length of head; maximum number of upper or lower teeth 12; body depth relatively great, about 1.7 to 1.8 in standard length; dorsal soft rays 28 to 33; anal soft rays 26 to 29....................................14

13b. Body not very dark brown or black with a white line under chin and a pale band at base of dorsal and anal fins; mouth not very small, its width from rictus to rictus contained 3.2 to 4.8 in length of head; number of teeth in upper or lower jaw 14 to 24 (in specimens over 50 mm long); body depth not great, 1.8 to 2.4 in standard length; dorsal soft rays 23 to 28; anal soft rays 22 to 26..............15

14a. Body with a large elliptical pale yellowish (orange in life) spot posteriorly, enclosing caudal peduncle spine (this pale area absent in specimens of about 65 mm or less in standard length); an elongate white spot at edge of opercle; no pale area under eye; pale line on chin not extending above rictus; caudal fin lunate; dorsal soft rays 29 to 33 (mostly 30 to 32)...............................Acanthurus achilles

14b. Body without a large elliptical pale spot posteriorly; no elongate white spot at corner of opercle; a pale area under eye; pale line on chin extending well above rictus; caudal fin emarginate to moderately concave; dorsal soft rays 28 to 31 (mostly 29 to 30)..........................Acanthurus glaucopareius

15a. Snout very short, its length contained 7.9 to 8.2 times in standard length; teeth very small (greatest length of undetached upper teeth .7 mm in 135 mm specimen); a dark brown spot extending slightly below axil of pectoral fin; entire caudal fin paler than body....... ....Acanthurus thompsoni

15b. Snout not very short, its length contained 3.9 to 5.3 in standard length; teeth not very small; no dark brown spot extending below axil of pectoral fin; entire caudal fin not paler than body................16

16a. A black spot at base of last few dorsal and anal rays... 17

16b. No black spot at base of last few dorsal and anal rays.. 18

17a. Caudal fin lunate, caudal concavity (horizontal distance from tip of upper lobe of caudal fin to most anterior portion of hind edge of fin) contained 4.5 to 6 times in standard length; a definite black margin around caudal peduncle spine groove; black spot at axil of soft dorsal fin large, its greatest width contained less than 2 times in greatest diameter of eye; a definite white margin to posterior edge of caudal fin; shape of ends of medial upper teeth (ignoring denticulations) pointed..*Acanthurus nigrofuscus*

17b. Caudal fin not lunate, caudal concavity contained 6.7 - 12 times in standard length; no black margin around caudal peduncle spine groove; black spot at axil of soft dorsal fin small, its greatest width contained more than 2 times in greatest diameter of eye; white margin to posterior edge of caudal fin barely discernible; shape of ends of medial upper teeth rounded...........................*Acanthurus nigroris*

18a. A horizontal pigmented bar on shoulder, either entirely black or pale yellowish with dark margins (this bar not present in juveniles).........................19

18b. No horizontal pigmented bar on shoulder...............21

19a. Shoulder bar pale yellowish (orange in life) edged in black (in specimens below about 80 mm the black border is not present; in specimens below about 45 mm there is no trace of a bar at all); a broad, white, crescent-shaped region in postero-central part of caudal fin; body uniform brown (pale in juveniles which are yellow in life) without longitudinal lines; dorsal soft rays 23 to 25 (usually 24); anal soft rays 22 to 24 (usually 23)........*Acanthurus olivaceus*

19b. Shoulder bar black; no broad, white, crescent-shaped region in postero-central part of caudal fin (though a white terminal margin is present on the caudal fin of *A. gahhm*); body dark brown, with or without faint, narrow, irregular, pale, longitudinal lines; dorsal soft rays 24 to 28; anal soft rays 22 to 26.........20

20a. Posterior edge of caudal fin with a distinct white margin; a long, black, lancet-like line extending forward from anterior end of caudal peduncle spine; no longitudinal bands or lines in dorsal or anal fins; no narrow, irregular, pale, longitudinal lines on body; no yellow spots on head in life; dorsal soft rays 25 to 28 (usually 26 or 27); anal soft rays 24 to 26...............................*Acanthurus gahhm*

20b. Posterior edge of caudal fin without a distinct white margin; no long black line extending forward from caudal peduncle spine; dorsal fin with longitudinal dark brown bands (about 8 in soft dorsal), alternating with pale bands (yellowish in life) of about the same width; numerous irregular pale (yellowish in life) longitudinal lines on body (faint or absent in preserved specimens); yellow spots on head in life; dorsal soft rays 24 to 26 (usually 25); anal soft rays 22 to 24 (usually 23)..Acanthurus maculiceps

21a. Outer 1/3 of pectoral fin pale (yellowish in life) and contrasting with darker basal 2/3 of fin (in specimens over about 120 mm in standard length); dorsal fin with about 4 broad lengthwise bands; caudal fin very lunate, caudal concavity about 4.5 to 7 in standard length; caudal spine usually small, about 4.5 to 5.5 in length of head; dark margin around socket of caudal spine usually narrow and indistinct; anterior gill rakers 16 to 22; posterior gill rakers 17 to 22. (Indo-Pacific)..Acanthurus xanthopterus

21b. Pectoral fin uniform brown; dorsal fin (at least in Hawaiian specimens) with about 8 narrow lengthwise bands; caudal fin not very lunate, caudal concavity about 6 to 10 in standard length; caudal spine usually not small, about 3 to 4.2 in length of head; a definite dark brown or black margin around socket of caudal spine forming an area about twice as high as maximum width of spine; white band at base of caudal fin usually distinct; anterior gill rakers 21 to 25; posterior gill rakers 23 to 25. (Indo-West-Pacific)..Acanthurus mata (not yet known from Gilbert Islands)

22a. Body with numerous pale longitudinal stripes (may be faint in preserved specimens); interradial membranes of pectoral fin hyaline; margin of lower lip smooth; teeth of upper jaw with 5 to 7 (usually 6) denticulations on expanded ends........Ctenochaetus striatus

22b. Body with stripes, when alive speckled with numerous bright blue spots which may or may not persist in preserved specimens; interradial membranes of pectoral fin dark brown; margin of lower lip papillate; teeth of upper jaw with 4 denticulations (counting the tip) on expanded ends............Ctenochaetus sp.

Genus NASO

Naso Lacépède 1802. Hist. nat. poiss., vol. 3, p. 105. (Type species, Naso fronticornis Lacépède = Chaetodon unicornis Forskål.

Naso lituratus

Acanthurus lituratus Bloch and Schneider 1801. Systema ichth., pp. xxxviii, 216.

This unmistakable species was sighted occasionally underwater at Onotoa and also at Butaritari; however, no specimens were secured.

Naso unicornis

Chaetodon unicornis Forskål 1775. Descr. animalium, p. xiii, 63. (Type locality, Djedda, Red Sea).

Naseus unicornis Günther 1873. Jour. Mus. Godeffroy, vol. 1, pp. 118-121, pl. 78.

Naso unicornis Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 297. (Nauru).

Naso brevirostris

Naseus brevirostris Cuvier and Valenciennes 1835. Hist. nat. poiss., vol. 10, p. 277. (Type locality, Moluccas, Mauritius, New Guinea, and Indian Ocean).

Naseus brevirostris Günther 1873. Jour. Mus. Godeffroy, vol. 1, p. 121, pl. 79, fig. A. (Kingsmill Islands).

Naso tuberosus

Naso tuberosus Lacépède 1802. Hist. nat. poiss., vol. 3, p. 111, pl. 7, fig. 3.

Naseus tuberosus Günther 1873. Jour. Mus. Godeffroy, vol. 1, p. 123, pl. 80.

Naso tuberosus Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 276. (Gilbert Islands).

Naso vlamingi

Naseus vlamingii Cuvier and Valenciennes 1835. Hist. nat. poiss., vol. 10, p. 293. (Type locality, Moluccas).

Although this species was consistently seen at the seaward edge of the outer reef at Onotoa in about 40 feet of water, no specimens were taken. It appeared almost black underwater. One specimen, when speared at Arno Atoll in the Marshall Islands, suddenly altered its dark color to pale, thus making evident the characteristic vertical blue lines and small blue spots on the body.

Naso sp.

A 37 mm specimen of Naso in the keris stage was obtained with rotenone in a tide pool 160 feet from shore on the sea reef flat at Onotoa. It is pale (transparent in life) with silver over abdomen and posterior part of head. There are 6 near-vertical rows of indistinct blackish spots on the dorsal half of the body, scattered tiny blackish flecks on posterior half of body, and a dusky band at the base of the caudal fin. The dorsal rays are VI, 27 and the anal rays II, 28. There are 16 pectoral rays. I am unable to identify the specimen to species; however I suspect that it may be brevirostris. It is definitely not unicornis, for this species has 17 or 18 pectoral rays and reaches a larger size in the keris stage (over 50 mm in standard length).

Genus PARACANTHURUS

Paracanthurus Bleeker 1863. Ned. Tijdschr. Dierk., vol. 1, p. 252. (Type species, Teuthis hepatus Linnaeus, in part).

Paracanthurus hepatus

Teuthis hepatus Linnaeus 1766. (in part). Syst. nat., ed. 12, p. 507.

Acanthurus theuthis Lacépède 1802. Hist. nat. poiss., vol. 4, pp. 547, 549.

Acanthurus hepatus Günther 1873. Journ. Mus. Godeffroy, vol. 1, p. 115, pl. 75. (Kingsmill Islands).

Genus ZEBRASOMA

Zebrasoma Swainson 1839. Nat. hist. and class. fishes, amphibians,..., vol. 2, p. 256. (Type species, Acanthurus velifer Bloch).

Zebrasoma veliferum

Acanthurus velifer Bloch 1795. Natur. ausländ. Fische, pt. 9, p. 106, pl. 427, fig. 1. (Type locality, East Indies).

2 specimens. 175 and 193 mm. 8 specimens. 20 - 25 mm. Onotoa.

Color of adult from 35 mm Kodachrome transparency purplish black with 6 vertical yellowish bands about 1/3 width of dark interspaces (except dark interspace through eye which is of comparable width) on head and body; narrow dark lines visible within the pale yellowish bands and narrow orangish vertical lines in the dark interspaces; snout purplish, densely covered with small greenish-yellow spots; fins purplish black; base of caudal fin with a whitish vertical band. Color of 20 mm juvenile pale yellow with vertical black bands, the 2 anterior ones (through eye and at edge of operculum) much blacker and more distinct; snout and base of caudal fin bright orange.

Adults were seen on both sea reef and deeper sections of the lagoon with moderate coral growth; the small juveniles were all taken in shallow-water lagoon area.

Zebrasoma scopas

Acanthurus scopas Cuvier 1829. Règne animal, ed. 2, vol. 2, p. 224. (Type locality, Neira, Province of Banda).

Zebrasoma flavescens Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 297. (Nauru).

1 specimen. 88 mm. 2 specimens. 32 and 34 mm. Onotoa.

Color in life of 88 mm specimen dark brown with numerous, narrow, wavy, light blue, longitudinal lines on body (anteriorly on the body these lines become dotted; on the head the linear pattern is lost and discrete blue dots occur); anterior median portion of the body yellow-brown; all fins except the pectoral dark brown; pectoral fin clear with dusky orange rays and a narrow black upper edge; caudal peduncle spine sheath white. Color of juvenile from 35 mm Kodachrome transparency: anterior fourth of body brownish yellow, posterior three-fourths dark brown; snout and interorbital space brown, remainder of head brownish yellow; body with numerous vertical lines; head and chest with many tiny pale yellow spots.

At Onotoa adults were seen only in the lagoon, hiding in the recesses in a mass of dead staghorn coral. They were observed on the sea reef at Butaritari on the lee side of the atoll. At Onotoa the young were taken from the environs of small isolated coral heads in a shallow-water section of the lagoon. No yellow Zebrasoma were seen by me in the Gilbert Islands.

Genus ACANTHURUS

Acanthurus Forskål 1775. Descr. animalium, p. 59. (Type species, Chaetodon sohal Forskål as designated by Jordan, 1917) (The genus Teuthis Linnaeus was restricted to the siganids by Opinion 93 of the International Commission on Zoological Nomenclature.)

Acanthurus triostegus

Chaetodon triostegus Linnaeus 1758. Syst. nat., ed. 10, p. 463. (Type locality, Indies).

Teuthis troughtoni Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 294, text fig. 3. (Nauru).

118 specimens. 21 to 114 mm. Onotoa.

1 specimen. 112 mm. Tarawa.

Color in life: light greenish gray, becoming abruptly white ventrally, with 4 narrow vertical black bars on body, 1 near-vertical bar through eye, and a short bar dorsally on caudal peduncle; a median black line on forehead; a small black spot ventrally on caudal peduncle; a small black spot, 2 spots, or a short bar at the base of the pectoral fin.

A. triostegus was a very common species on both inshore sea reef and sandy shallow-water lagoon areas. In the first 175 feet of a 50 foot wide transect of the outer reef flat at Onotoa, 29 juvenile specimens were taken with rotenone ranging in size from 23 to 35 mm. In the next 120 feet (approximately 95% covered with water at low tide when the inshore 175 feet is about half covered), 81 specimens were obtained of sizes 21 to 52 mm. In the next 120 feet only 2 small specimens were taken. Adults appeared in the Jania zone still farther from shore and in the so called back ridge trough. No quantitative data were secured from the deeper areas of the outer reef.

Acanthurus guttatus

Acanthurus guttatus Bloch and Schneider 1801. Systema ichth., pp. xxxviii, 215. (Type locality, Tahiti).

Teuthis guttatus Kendall and Goldsborough 1911. Mem. Mus. Comp. Zool., vol. 26, p. 310. (Butaritari, Gilbert Islands).

Teuthis fuliginosus Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 294, pl. 14, fig. 4. (Nauru).

3 specimens. 33 - 165 mm. Onotoa.

1 specimen. 160 mm. Tarawa.

Color from 35 mm Kodachrome transparency brown with posterior half of body covered with small white spots; a vertical white band from origin of dorsal to edge of opercle; another broader white band from the base of the 3rd to 5th dorsal spines to region of anus; a third, narrow, white band from the 3rd dorsal soft ray to the 3rd anal soft ray; region of chest white; pelvic fins bright yellow with narrow dark brown margins; caudal fin brown, whitish at base, and dark brown terminally.

This species was observed only in the surge channels of the outer reef where it swam rapidly about in small schools in the roughest, milky-white water of this habitat.

The stomach contents of 10 specimens were examined; the bulk of the material was algal, though there was some fine calcareous sand. Many kinds of algae were present, but _Jania_ probably predominated. Presence of the blue-green _Calothrix_ indicates a cropping close to the substrate.

Acanthurus lineatus

Chaetodon lineatus Linnaeus 1758. Syst. nat., ed. 10, p. 274. (Type locality, Indies).

10 specimens. 35 - 170 mm. Onotoa.

2 specimens. 163 and 170 mm. Tarawa.

Color from 35 mm Kodachrome transparency: upper 3/4 of body yellow with 10 black lengthwise stripes, each stripe containing a bright blue center (these stripes continue on to head where they are narrower and tend to converge on eye); lower fourth of head and body bluish white; pelvic fins orange with dark lateral margin; caudal fin black with a large crescent-shaped dusky yellowish area narrowly margined in blue in the posterior median part of the fin; pectoral pale; dorsal fin yellowish, lined with blue; anal fin yellowish.

Juveniles about 40 mm in length displayed, in addition to colors like adults, red coloration on dorsal and anal fins (especially posteriorly).

This species was abundant in or near surge channels of the outer reef at Onotoa and was also very common in relatively shallow quiet water of protected reef areas such as the lagoon side of the west reef of the atoll.

The gut contents of 10 specimens, 120 to 160 mm in length, consists primarily of finely divided red algae.

Acanthurus achilles

Acanthurus achilles Shaw 1803. General zoology, vol. 4, pt. 2, p. 383.

3 specimens. 108 - 119 mm. Onotoa.

1 specimen. 129 mm. Tarawa.

Color from 35 mm Kodachrome transparency black with a large bright orange elliptical spot enclosing caudal peduncle spine; dorsal and anal fins black with narrow dual-colored (outer half orange, inner half bluish white) lines basally in posterior parts of these fins; anal fin with a narrow blue margin; a white patch at edge of opercle; a light blue line under chin; iris blue; pelvic fins black with lateral blue margin; caudal fin with a narrow white margin, a narrow black submarginal line and then a broad bright orange zone; basal half of fin black.

This species was seen only in the surge channels at Onotoa. Its abundance varied in different parts of the atoll in spite of apparent similarity of the surge channels in the different areas.

Acanthurus glaucopareius

Acanthurus glauco-pareius Cuvier 1829. Règne animal, ed. 2, vol. 2, p. 224. (Type locality as indicated by Günther 1861, Tahiti).

Acanthurus aliala Lesson 1830. Voyage autour du monde... "Coquille",...vol. 2, pt. 1, p. 150.

Teuthis glaucopareius Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 297. (Nauru).

11 specimens. 50 - 107 mm. Onotoa.

1 specimen. 155 mm. Tarawa.

Color from 35 mm Kodachrome transparency purplish black; dorsal and anal fins with a yellow band basally which broadens posteriorly; anal fin with narrow blue margin; a prominent white patch under eye; a white line on chin adjacent to lower lip extending well above corner of mouth and running adjacent to upper lip; caudal spine yellow; caudal fin light bluish gray with a submarginal yellow band; pelvic fins black with a blue lateral edge; membranes of pectoral fins clear, the rays blackish. In three specimens 52 to 55 mm in length the submarginal band in the caudal fin was red instead of yellow.

This was a very abundant species on the coralliferous terrace of the outer reef at Onotoa and in coral areas in the lagoon. It was also observed at Butaritari.

The gut of six specimens, 70 to 145 mm in standard length, was filled with algae, mostly filamentous reds.

Acanthurus thompsoni

Hepatus thompsoni Fowler 1923. Occ. Pap. B. P. Bishop Mus., vol. 7, p. 386. (Type locality, Honolulu).

Acanthurus philippinus Herre 1927. Philip. Jour. Sci., vol. 34, p. 434, pl. 5, fig. 1.

Acanthurus philippinus Schultz and Woods in Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, vol. 1, p. 637.

1 specimen. 138 mm. Onotoa.

Color from 35 mm Kodachrome transparency: uniform brown with a dusky white caudal fin; iris blue; dorsal and anal fins dark brown with still darker longitudinal bands barely discernible. In life the most conspicuous feature of this species was its pure white caudal fin; this faded to dusky white after death.

Only two specimens were seen at Onotoa. Both of these occurred as solitary individuals at the extreme seaward edge of the coralliferous terrace of the outer reef. One was speared from 35 feet of water.

Acanthurus nigrofuscus

Chaetodon nigro-fuscus Forskål 1775. Descr. animalium, pp. xiii, 64. (Type locality, Red Sea).

Acanthurus elongatus Schultz and Woods in Schultz and collaborators (in part) 1953. Bull. U. S. Nat. Mus. 202, vol. 1, p. 634, pl. 62, fig. D.

3 specimens. 38 - 93 mm. Onotoa.

No life color notes taken for adults. Color in life of 38 mm juvenile: body brown with a prominent black spot at the base of the last few rays of the dorsal fin; dorsal and anal fins with a thin pale blue margin and a narrow black submarginal line; remainder of these fins with faint alternating red and blue bands; caudal fin brown with upper and lower margins reddish.

Specimens were obtained from both the sea reef and from the lagoon near the west reef.

Acanthurus nigroris

Acanthurus nigroris Cuvier and Valenciennes 1835. Hist. nat. poiss., vol. 10, p. 208. (Type locality, Hawaii).

Acanthurus lineolatus Günther 1873. Jour. Mus. Godeffroy, vol. 1, p. 112, pl. 73, fig. A.

Teuthis atrimentatus Jordan and Evermann 1905. Bull. U. S. Fish Comm. vol. 22, p. 198.

Acanthurus elongatus Schultz and Woods *in* Schultz and collaborators (in part) 1953. Bull. U. S. Nat. Mus. 202, vol. 1, p. 634, pl. 62, fig. C.

2 specimens. 57 and 93 mm. Onotoa.

1 specimen. 143 mm. Tarawa.

Onotoa specimens were taken with rotenone from the outer sea reef.

Acanthurus olivaceus

Acanthurus nigricans var. *olivaceus* Bloch and Schneider 1801. Systema ichth., pp. xxxviii, 214.

No specimens were obtained. D. W. Strasburg observed a bright yellow colored juvenile in shallow water of the Onotoa lagoon.

Acanthurus gahhm

Chaetodon nigro-fuscus var. *gahhm* Forskål 1775. Descr. animalium, pp. xiii, 64. (Type locality, Red Sea).

Acanthurus nigricans Schultz and Woods *in* Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, vol. 1, p. 633, pl, 68.

27 specimens. 23 - 188 mm. Onotoa.

Color from 35 mm Kodachrome transparency of a 165 mm specimen: dark brown with an elongate, nearly horizontal black bar originating just anterior to upper end of gill opening and extending posteriorly to level of the 6th dorsal spine; caudal peduncle spine socket narrowly margined with black, this color extending anteriorly in a horizontal, lancet-like mark greater in length than the length of the caudal spine; pectoral fin with basal two-thirds dark brown, outer one-third yellow, especially in upper part; dorsal fin uniform dark brown; anal fin dark brown with a narrow bright blue margin; caudal fin dark brown with a distinct white margin, broader in central part of fin and gradually disappearing on the greatly extended upper and lower lobes of the fin. The shoulder bar is absent in juveniles. It can be seen just forming in a specimen 57 mm long. The black lancet-like line extending forward from caudal peduncle spine is also an adult feature; it is just beginning to form in an 82 mm specimen. Small juvenile specimens were chocolate brown in color with the caudal fin abruptly white basally, dusky white distally. Specimens were obtained transforming from the Acronurus stage at a length of 23 to 26 mm.

This species was very abundant at Onotoa and was seen at Butaritari. It was found around the base of isolated coral heads in sandy lagoon areas and was never seen on the ocean side of the atoll. The very small juveniles were common in tidal flats and shallow tide pools in the lagoon, but were never taken from sea reef tide pools. This suggests that the majority of the species either completes the life cycle in the lagoon or that the pelagic young avoid outer reef areas and pass through channels to reside in the shallow quiet waters of the lagoon. A third, but unlikely possibility is that the young experience heavy mortality in sea reef tidepools. The young of Acanthurus triostegus, however, do not appear to undergo any serious mortality in this habitat.

The gut of a 160 mm specimen was filled with fine yellowish grit such as can be found in the gut of scarids.

Acanthurus maculiceps

Hepatus maculiceps Ahl 1923. Mitt. Zool. Mus. Berlin., vol. 11, pt. 1, p. 36, fig. 4. (Type locality, Talassia, New Britain).

1 specimen. 194 mm. Onotoa.

1 specimen. 203 mm. Tarawa.

Color in life dark brown with numerous, narrow, pale yellowish, longitudinal lines on body; a short horizontal black bar on shoulder (19 mm in length in the 194 mm specimen), its forward end located slightly posterior to upper end of gill opening; head brown with numerous prominent cream-colored spots; pectoral fin blackish with a large yellow spot on the distal third of the upper 6 rays; caudal fin brown with a bright white band at base which quickly faded upon death of the specimen.

The Onotoa specimen was speared in about 20 feet of water on the coralliferous terrace of the outer reef.

This constitutes the first record of this species in Oceania.

Acanthurus xanthopterus

Acanthurus xanthopterus Cuvier and Valenciennes 1835. p. 215. (Type locality, Seychelles).

Acanthurus blochii Günther 1873. Jour. Mus. Godeffroy, vol. 1, p. 109, pl. 69, fig. B.

Acanthurus matoides de Beaufort 1951. Fishes Indo-Austral. Arch., vol. 9, p. 156.

Acanthurus fuliginosus Schultz and Woods in Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, vol. 1, p. 637.

2 specimens. 47 and 200 mm. Tarawa.

The 200 mm specimen was speared at a depth of 39 feet in the Tarawa lagoon. While still alive the following color note was made: the color changed back and forth from a uniform purplish gray to a phase where highly irregular dark gray lines alternated with light blue-gray lines, all of these lines about 2 scales in width; base of caudal fin and adjacent portion of caudal peduncle very light gray; ventral two-thirds of eye edged in yellow; a region of dull yellow extending anteriorly from eye a distance equal to about 1 eye diameter; a lesser posterior extension of yellow from lower corner of eye; dorsal and anal fins yellowish (especially distally) with a bluish gray line at the base and 4 longitudinal blue bands; outer margins of dorsal and anal fins very narrowly black; basal two-thirds of pectoral fins dusky; then a region of yellow, then clear; pelvic rays purplish, the membranes dusky yellow; caudal fin, except basally as noted, purplish gray.

The gut of this specimen was filled with yellowish particulate calcium carbonate like the specimen of A. gahhm.

Genus CTENOCHAETUS

Ctenochaetus Gill 1885. Proc. U. S. Nat. Mus., vol. 7, p. 279. (Type species, Acanthurus strigosus Bennett).

Ctenochaetus striatus

Acanthurus striatus Quoy and Gaimard 1824. Voyage autour de monde..."Uranie", Zool., vol. 2. p. 373; Atlas, pl. 63, fig. 3. (Type locality, Guam).

Ctenochaetus ctenodon Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 294. (Nauru).

36 specimens. 32 - 130 mm. Onotoa.

Color in life of adults dark olive brown with numerous narrow lengthwise bluish lines on the body; head finely spotted with orange; dorsal and anal fins olive brown with about 5 lengthwise blue bands. Specimens about 40 mm in length presented a different coloration. On the body were narrow, red, lengthwise lines which inclined slightly downward as they ran posteriorly. The brown interspaces between were about 2 to 3 times the width of the red lines, and centrally within these brown areas, bluish lines were beginning to appear. The tips of the caudal fin were red.

Of the fishes collected at Onotoa, this species was the dominant one on a weight basis. At most of the poison stations the take of Ctenochaetus striatus exceeded that of any other species, and the number of specimens was frequently the highest. It was abundant in almost all habitats.

The gut contents of seven specimens, 110 to 135 mm in standard length appears to consist only of fine particles of yellowish calcium carbonate.

Ctenochaetus sp.

Ctenochaetus sp. Randall (in press, Zoologica)

Ctenochaetus sp. Hiyama 1943. Rep. of an invest. of poisonous fishes of the South Seas, p. 93, pl. 19, fig. 53.

Ctenochaetus strigosus Schultz (in part) 1943, Bull. U. S. Nat. Mus. 180, p. 161.

2 specimens. 170 and 175 mm. Onotoa.

Color in life: head and body brown, covered with small bright blue spots; dorsal and anal fins dark brown with 9 to 10 lengthwise bluish bands; pectoral dark brown with blue spots; caudal and pelvic fins dark brown.

Both specimens were speared from a poorly-defined surge channel region just beyond the surf zone in the northwest corner of the atoll in about 5 feet of water. The species was observed only in small schools in turbulent water.

Ctenochaetus sp.

I am unable to identify a 35 mm specimen of *Ctenochaetus* which was collected from the Onotoa lagoon. It had a bright yellow caudal fin in life. Later examination of the specimen in alcohol revealed the last few rays of the soft dorsal and anal fins to be colorless except for a small black spot at the base of these rays; small brown spots could be perceived on the head and anteriorly on the body. The counts are: D VIII, 27; A III, 25; P 15; anterior gill rakers 27; posterior gill rakers 27. There are 22 upper and 22 lower teeth. The upper teeth bear 6 or 7 (usually 7) denticulations and the lower teeth 3 or 4 (mostly 4). This may be the young of *Ctenochaetus* sp. Randall (in press, *Zoologica*), reported only from the Philippine Islands and East Indies.

Table 5. Fin Ray Counts of the Acanthuridae Collected in the Gilbert Islands

Dorsal fin

	Spines				Soft rays*											
	IV	V	VII	IX	22	23	24	25	26	27	28	29	30	31	32	33
Z. veliferum	10													4	4	2
Z. scopas		3				3										
A. triostegus				33	9	22	2									
A. guttatus				4						2	2					
A. lineatus				8						5	3					
A. achilles				4										4		
A. glaucopareius				12							1	7	3	1		
A. thompsoni				1				1								
A. xanthopterus				2					1	1						
A. gahhm				12				1	7	4						
A. maculiceps				2			1	1								
A. nigrofuscus				3			2		1							
A. nigroris				3			2	1								
C. cyanoguttatus			2							2						
C. striatus			28							1	9	13	4	1		

*Each fin ray with a distinct base was counted, regardless of how close adjacent rays might be. At times dissection was necessary to determine whether the last two rays of the dorsal and anal fins shared the same basal element or not.

Table 5 (Cont.) Anal fin

	Spines	Soft rays									
	III	19	20	21	22	23	24	25	26	27	28
Z. veliferum	10						4	5	1		
Z. scopas	3	3									
A. triostegus	33	3	19	11							
A. guttatus	4						2	2			
A. lineatus	8								2	4	2
A. achilles	4									1	3
A. glaucopareius	12								5	6	1
A. thompsoni	1						1				
A. xanthopterus	2						2				
A. gahhm	12						4	7	1		
A. maculiceps	2				1	1					
A. nigrofuscus	3				1	1	1				
A. nigroris	3				2	1					
C. cyanoguttatus	2							2			
C. striatus	28						1	5	21	1	

Family TEUTHIDIDAE (= Siganidae of authors)

Genus TEUTHIS

Teuthis Linnaeus 1766. Syst. nat., ed. 12, p. 507. (Type species, Teuthis javus) (Designated in Opinion 93 of the International Commission on Zoological Nomenclature).

Siganus Forskål 1775. Descr. animalium, pp. x, 25.

Teuthis rostrata

Amphacanthus rostratus Cuvier and Valenciennes 1835. Hist. nat. poiss., vol. 10, p. 158. (Type locality, Massuah, Red Sea).

Siganus argenteus Woods in Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, pp. 649, 651.

Siganus rostratus Woods in Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, pp. 650, 654, pl. 74.

3 specimens. 160 - 220 mm. 12 specimens. 50 - 62 mm. Onotoa.

D XIII,10; A VII,9; P 18; V I,3,I. (4 specimens).

Color in life dark olivaceous blue with numerous indistinct pale orangish spots; spinous dorsal, posterior part of caudal, spinous anal, and pectoral fins olive-yellow; soft dorsal and soft anal fins with rays olive, membranes hyaline.

Color in alcohol of 62 mm specimen brown, paler over abdomen and cheek, with a dense stippling of tiny black dots on dorsal two-thirds of body; about 10 or 12 small brownish blotches on posterior part of body; upper and lower margins of caudal fin with a row of small brown spots; membranes of spinous dorsal dusky, especially basally and distally. This color pattern is quite intermediate to subadult rostratus and smaller specimens identified by Woods as argenteus, and I believe that the former represent the late postlarval stage of the latter, as suspected by Woods. His specimens of argenteus were pelagic and came to a light at night.

One 60 mm specimen was speared near a rock jetty in the lagoon by D. W. Strasburg. Subsequently 11 others of comparable size were taken with rotenone in the same area. No adults were seen in the lagoon, but were occasionally observed in outer reef areas. The 160 mm specimen was speared from a slow swimming dense school on the outer coralliferous terrace at a depth of about 20 feet. There was no scattering of individual fish of the school at my approach nor any increase in rate of swimming. I had the misfortune to be spined by the speared specimen. A stinging pain followed almost immediately and lasted for about a half an hour.

Teuthis punctata

Amphacanthus punctatus Bloch and Schneider 1801. Systema ichth., p. 210. (Type locality, Pacific Ocean).

Siganus punctatus Woods in Schultz and collaborators 1953. Bull. U. S. Nat. Mus. 202, pp. 650, 657.

1 specimen. 85 mm. Onotoa.

D XIII,10; A VII,9; P 16; V I,3,I.

Color in life dark brown with numerous, close-set, prominent dusky orange spots on head and body.

The specimen was taken in the lagoon in about 5 feet of water near a large expanse of Thalassia.

Teuthis puella

Amphacanthus puellus Schlegel 1852. Bijdr. Dierk., vol. 1, p. 39, fig. 1. (Type locality, East Indies).

Teuthis puella Günther 1873. Jour. Mus. Godeffroy, vol. 2, pt. 3, p. 91. (Abemama, Gilbert Islands).

Family CIRRHITIDAE

The hawk fishes have, as their most characteristic feature, the lower 6 or 7 pectoral rays swollen and unbranched. These carnivorous fishes are sedentary, and though less camouflaged than the scorpaenids which have the same habit, they are usually not seen until they move from one part of the reef to another.

In the discussions below under Cirrhitichthys and Paracirrhites, clarification of some of the problems in the generic classification as concerns the Gilbert Islands species is attempted.

Key to the Species of Cirrhitidae Recorded from the Gilbert Islands

1a. Tiny indistinct scales on cheek; 40 or 41 transverse scale rows from upper end of gill opening to base of caudal fin; brown spots on dorsal, anal, and caudal fins; black blotches on back adjacent to dorsal fin and dorsally on caudal peduncle...*Cirrhitus pinnulatus*

1b. 4 to 6 rows of large scales on cheek; 43 to 51 transverse scale rows from upper end of gill opening to base of caudal fin; no brown spots on dorsal, anal, and caudal fins (except faintly in *P. polystictus*); no black blotches on back adjacent to dorsal fin and dorsally on caudal peduncle (blotches, if present in this location, light brown)..................2

2a. Preopercular margin strongly serrated; dorsal spines long, length of 4th dorsal spine less than 2 in head length (measured from snout to most posterior extension of opercular membrane); interorbital narrow, bony interorbital width contained about 2 times in eye; dorsal soft rays 12; annulations plainly visible in lower pectoral rays; dorsal half of body with large roundish blotches (as large or larger than eye)...............*Cirrhitichthys aprinus*

2b. Preopercular margin finely serrated (in part, smooth); dorsal spines not long, length of 4th dorsal spine about 3 in head length; interorbital not narrow, bony interorbital width contained 1.5 or less times in eye; dorsal soft rays 11; annulations not plainly visible in lower pectoral rays; dorsal half of body without large roundish blotches (spots, if present, distinctly smaller than eye)..........................3

3a. A diagonal "U" shaped mark behind eye, the ends confluent with eye; no dark spots on head or body; body moderately compressed, its maximum width just posterior to gill opening contained 2.1 to 2.5 in head length..........................*Paracirrhites arcatus*

3b. No "U" shaped mark behind eye; dark spots on head or body; body not moderately compressed, its maximum width just posterior to gill opening contained 1.7 to 2.1 times in head length..........................4

4a. Black spots on head and anterior part of body; transverse scale rows 46 to 49; median fins pink in life...........................*Paracirrhites forsteri*

4b. No black spots on head (numerous on body); transverse scale rows 49 to 51; median fins not pink in life....5

5a. Color dark brown (head reddish in life) with a white spot nearly as large as eye just above mid-line of body below 8th and 9th dorsal spines; black spots on body present ventrally as well as dorsally; no median pale line on side of body.......................
...........................*Paracirrhites polystictus*

5b. Color brown on back, tan ventrally, with no white spot on side of body; no black spots on lower third of body; a median pale (pinkish white in life) line on side of body...Paracirrhites hemistictus

Genus CIRRHITUS

Cirrhitus Lacépède 1803. Hist. nat. poiss., vol. 5, p. 2. (Type species, Cirrhitus maculatus Lacépède = Labrus pinnulatus Bloch and Schneider).

Cirrhitus pinnulatus

Labrus pinnulatus Bloch and Schneider 1801. Systema ichth., p. 264. (Type locality, Tahiti).

Cirrhitus pinnulatus Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 293. (Nauru).

4 specimens. 53 - 123 mm. Onotoa.

1 specimen. 119 mm. Tarawa.

Color from 35 mm Kodachrome transparency white with large irregular brown blotches and small reddish spots on body and irregular yellowish brown lines on head; 5 large blackish blotches on back adjacent to dorsal fin and dorsally on caudal peduncle; median fins with brown spots; pectoral fin light reddish.

This species was collected only from surge channels of the outer reef.

The stomach of one adult specimen contained the chelae and gastric mill of a brachyuran crab. Another was empty.

Genus CIRRHITICHTHYS

Cirrhitichthys Bleeker 1857. Act. Soc. Sci. Indo-Neerl., vol. 2, p. 39. (Type species, Cirrhites graphidopterus Bleeker = Cirrhites aprinus Cuvier and Valenciennes).

Cirrhitoidea Jenkins 1903. Bull. U. S. Fish Comm., vol. 22, p. 489. (Type species, Cirrhitoidea bimacula Jenkins).

Acanthocirrhitus Fowler 1938. Proc. U. S. Nat. Mus., vol. 85, p. 50. (Type species, Cirrhites oxycephalus Bleeker).

Paracirrhites Schultz (not of Bleeker) 1943. Bull. U. S. Nat. Mus. 180, p. 134.

Jenkins erected Cirrhitoidea for the single species bimacula, apparently unaware of Cirrhitichthys Bleeker, a genus into which bimacula fits very nicely. Jenkins is mistaken in stating that there are no palatine teeth on bimacula. I examined the holotype and found teeth present at this location. Paracirrhites cinctus Jenkins (= Cirrhites fasciatus Bennett, 1828) and Cirrhites oxycephalus Bleeker also belong in the genus Cirrhitichthys.

Schultz (1943) listed aprinus in the genus Cirrhiticthys, but placed bimacula in Paracirrhites.

Cirrhitichthys aprinus

Cirrhites aprinus Cuvier and Valenciennes 1829. Hist. nat. poiss., vol. 3, p. 76. (Type locality, Timor).

3 specimens. 34 - 49 mm. Onotoa lagoon.

Color in alcohol tan with large brown blotches on dorsal half of body, largest and most prominent adjacent to dorsal fin (the upper part of the latter spots extending on to basal parts of dorsal fin rays); a black spot at base of first 2 or 3 dorsal spines; head with scattered small brown spots.

Genus PARACIRRHITES

Paracirrhites Bleeker 1874. Poiss. Madagascar et Réunion, p. 93. (Type species, Grammistes forsteri Bloch and Schneider).

Amblycirrhitus Schultz (not of Gill) 1943. Bull. U. S. Nat. Mus., 180, p. 132.

Gymnocirrhites Smith 1951. Ann. Mag. Nat. Hist., ser. 12, vol. 4, pp. 627, 638. (Type species, Cirrhites arcatus Cuvier and Valenciennes).

The type species of the genus Amblycirrhitus Gill is Cirrhites fasciatus Cuvier and Valenciennes (1829: 76, pl. 47). Fowler (1938: 49), noting that this name was preoccupied by Cirrhites fasciatus Bennett (1828: 39), proposed Amblycirrhitus indicus to replace it. This species, according to the plate of Cuvier and Valenciennes, is a deep-bodied form with the fin membranes of the spinous dorsal fin attached to anterior edges of the spines about one-third to one-half the length of the spines from their base. Schultz' (1943) use of Amblycirrhitus for the species arcatus, hemistictus, and polystictus does not seem advisable, for these species do not resemble Amblycirrhitus indicus but appear to be closely related to Paracirrhites forsteri. For the same reason, the erection of the new genus

Gymnocirrhites for these three species by Smith (1951) is also not well founded.

Paracirrhites arcatus

Cirrhites arcatus Cuvier and Valenciennes 1829. Hist. nat. poiss., vol. 3, p. 74. (Type locality, Mauritius and Tahiti).

7 specimens. 49 - 85 mm. Onotoa.

Color in alcohol brown, darker on dorsal half of body, with a broad pale band running on back from base of caudal fin to a point beneath the 7th dorsal spine (the lateral line runs through the ventral part of this pale band); a "U" shaped pale line (red in life) edged in black, extending diagonally upward from hind part of eye; 2 or 3 diagonal pale dark-edged lines on opercle at level of base of pectoral fin.

There is variability in color in this species as shown in pl. 49, figs. B and C of Günther (1873).

P. arcatus was always seen in association with live coral. With the possible exception of P. forsteri it was the most abundant cirrhitid at Onotoa.

Paracirrhites forsteri

Grammistes forsteri Bloch and Schneider 1801. Systema ichth., p. 191. (Type locality, St. Christine or Waitaho, Marquesas Islands).

11 specimens. 64 - 120 mm. Onotoa.

2 specimens. 98 and 126 mm. Tarawa.

Color from 35 mm Kodachrome transparency: back and head dorsal to level of eye dark purple; below this a broad band of pale yellow; head and anterior part of body with small dark reddish brown spots; median fins pink; pelvic fins light yellow-orange; pectoral fins pale pinkish.

This species was common in coral regions of the lagoon and outer reef.

The stomachs of four specimens, 82 to 112 mm in standard length, were opened. Three were empty, and one contained a small shrimp.

Paracirrhites polystictus

Cirrhites polystictus Günther 1873. Jour. Mus. Godeffroy, vol. 2, pt. 3, p. 70, pl. 50, fig. A. (Type locality, Society Islands and Kingsmill Islands).

3 specimens. 147 - 190 mm. Onotoa.

1 specimen. 146 mm. Tarawa.

Color from 35 mm Kodachrome transparency dark brown, head brownish red, with a bright pinkish white spot almost as large as eye just above mid-line of body below 8th and 9th dorsal spines; rows of dark brown or black spots on side of body (ventrally on body these fuse to form lengthwise lines); median fins dark brown with still darker spots faintly visible; pelvic fins dark brown; pectoral fins orange.

The stomach of one specimen contained a small pomacentrid fish.

Paracirrhites hemistictus

Cirrhites hemistictus Günther 1873. Jour. Mus. Godeffroy, vol. 2, pt. 3, p. 69, pl. 50, fig. B. (Type locality, Kingsmill Islands and Society Islands).

1 specimen. 110 mm. Onotoa.

1 specimen. 168 mm. Tarawa.

Color from 35 mm Kodachrome transparency of 185 mm specimen collected by me at Arno, Marshall Islands: upper half of body dark greenish, lower half light greenish, these two regions separated by a pinkish white band; dark greenish part of body densely spotted with black; light greenish ventral region with brownish yellow spots or brownish yellow dotted lengthwise lines; head gray; dorsal fin dusky yellow; caudal and anal fins yellow; paired fins yellow-orange.

Marshall (1950: 183, pl. 18, lowermost figure) described a form from Cocos-Keeling Islands which he believed intermediate to polystictus and hemistictus, and placed polystictus in the synonymy of hemistictus. I believe that these two are valid species, and the intermediate specimen should be re-examined on the possibility of its being a hybrid.

Table 3 Counts Made on the Cirrhitidae Collected in the Gilbert Islands

	Dorsal fin			Anal fin		Pectoral
	spines	rays		spines	rays	fin rays
	X	11	12	III	6	14
C. pinnulatus	5	5		5	5	5
C. aprinus	3		3	3	3	3
P. arcatus	7	7		7	7	7
P. forsteri	11	11		11	11	11
P. polystictus	3	3		3	3	3
P. hemistictus	2	2		2	2	2

	Transverse scale rows											
	40	41	42	43	44	45	46	47	48	49	50	51
C. pinnulatus	2	3										
C. aprinus				2	1							
P. arcatus						1	2	4				
P. forsteri							2	5	3	1		
P. polystictus										1	1	1
P. hemistictus										1	1	

Family SCORPAENIDAE

Only six species of scorpion fishes were collected at Onotoa. Two small juvenile specimens, however, were not identified to species. Fowler (1928) reported a specimen collected by Garrett from the Gilbert Islands as *Dendrochirus zebra*. Whitley and Colefax (1938) listed *Pterois volitans* from Nauru. This is less than half the number of scorpaenids which I would expect to occur in the Gilbert Islands.

Synancea was not seen but is probably present throughout the Gilberts. I was told that a British girl at Tarawa was spined by a stone fish and suffered several days until a Gilbertese volunteered his services and stopped the pain. He would not divulge the secret of his cure; this was supposedly passed on from father to son, and by virtue of it, the possessor maintained a lofty position in the community.

Genus SCORPAENA

Scorpaena Linnaeus 1758. Syst. nat., ed. 10, p. 266. (Type species, *Scorpaena porcus* Linnaeus).

Scorpaena albobrunnea

Scorpaena albo-brunnea Günther 1873. Jour. Mus. Godeffroy, vol. 2, pt. 3, p. 77. (Type locality, Palau Islands).

8 specimens. 26 - 64 mm. Onotoa.

D XII,9; A III,5; P 15 or 16; transverse scale rows from upper end of gill opening to mid-base of caudal fin 49 to 51. (3 specimens).

Color from 35 mm Kodachrome transparency brown with large blotches of chartreuse; pectoral fin yellow.

The specimens were collected in coralliferous areas of the lagoon, outer reef, and a shallow channel.

Genus SCORPAENODES

Scorpaenodes Bleeker 1857. Nat. Tijdschr. Ned.-Ind., vol. 13, p. 371. (Type species, Scorpaena polylepis Bleeker).

Scorpaenodes kelloggi

Sebastopsis kelloggi Jenkins 1903. Bull. U. S. Bur. Fish., vol. 22, p. 492, fig. 37. (Type locality, Honolulu).

2 specimens. 23 and 24 mm. Onotoa lagoon.

D XIII,8; A III,5; P 18; transverse scale rows from upper end of gill opening to mid-base of caudal fin 30. (1 specimen).

Color in alcohol: head brown, body with 4 broad vertical brown bars, the intervening areas light brown dorsally and pale tan ventrally except on caudal peduncle where entire area is pale; dusky areas basally in dorsal fin above each brown bar; a dusky brown area at base of anal fin; caudal fin hyaline with small brown spots; pectoral fins hyaline with dusky area basally on rays; pelvic fins dusky.

Scorpaenodes parvipinnis

Scorpaena parvipinnis Garrett 1863. Proc. Calif. Acad. Sci., p. 105. (Type locality, Hawaiian Islands).

3 specimens. 62 - 80 mm. Onotoa.

D XIII,10; A III,5; P 17 or 18; transverse scale rows from upper end of gill opening to mid-base of caudal fin 47 or 48 (2 specimens).

Color in alcohol light brown with 5 irregular broad brown bars on upper one-half to two-thirds of body which extend up into dorsal fin; head and lips with irregular brown spots; all fins with small blackish spots. A color note from life: mottled orange.

The specimens were taken in two diverse habitats, a surge channel and a coral head in the lagoon.

Genus SCORPAENOPSIS

Scorpaenopsis Heckel 1839. Ann. Wiener Mus., vol. 2, p. 158. (Type species, Scorpaena nesogallica Cuvier and Valenciennes).

Scorpaenopsis gibbosa

Scorpaena gibbosa Bloch and Schneider 1801. Systema ichth., p. 192, pl. 44. (Type locality, America).

2 specimens. 93 and 95 mm. Onotoa.

D XII,9; A III,5; P 18; transverse scale rows from upper end of gill opening to mid-base of caudal fin 43. (1 specimen).

Color from 35 mm Kodachrome transparency: head and body irregularly mottled with white, brown, and red (except abdomen which is white); caudal fin white with a broad reddish submarginal band spotted with brown and a blackish band at the base.

Both specimens were collected from the same locality, a poorly-defined surge channel zone on the leeward side of the atoll.

Genus BRACHYRUS

Brachyrus Swainson 1839. Nat. hist. and class. fishes, amphibians,..., vol. 2, p. 264. (Type species, Pterois zebra Quoy and Gaimard).

Brachyrus zebra

Pteroïs zebra Quoy and Gaimard 1824. Voyage autour du monde..."Uranie", Zool., p. 329. (Type locality, Coupang Bay, Timor).

Dendrochirus zebra Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 294. (Gilbert Islands).

Genus PTEROIS

Pterois Oken 1817. Isis, p. 1782. (Type species, Gasterosteus volitans Linnaeus).

Pterois volitans

Pterois volitans Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 299. (Nauru).

Pterois radiata

Pterois radiata Cuvier and Valenciennes 1829. Hist. nat. poiss., vol. 4, p. 369. (Type locality, Society Islands).

8 specimens. 50 - 130 mm. Onotoa.

2 specimens. 100 and 124 mm. Tarawa.

D XII,11; A III,6; P 16; transverse scale rows from upper end of gill opening to mid-base of caudal fin 50 to 51. (2 specimens).

Color from 35 mm Kodachrome transparency light brownish red with broad reddish brown, white-edged bands on head and body (all of these bands are more-or-less vertical except one on caudal peduncle which is horizontal and one on head running diagonally from eye toward lower base of pectoral fin); fins hyaline with the long rays light red or white; supraorbital tentacle not dark and white banded.

All of the specimens from Onotoa were collected from around isolated coral heads in calm lagoon or channel waters.

Genus TAENIANOTUS

Taenianotus Lacépède 1802. Hist. nat. poiss., vol. 4, p. 303. (Type species, Taenianotus triacanthus Lacépède).

Taenianotus triacanthus

Taenianotus triacanthus Lacépède 1802. Hist. nat. poiss., vol. 4, p. 303.

1 specimen. 35 mm. Onotoa channel.

D XII,11; A III,6; P 14.

Color in alcohol dark brown mottled with white.

Family PLATYCEPHALIDAE

Genus THYSANOPHRYS

Thysanophrys Ogilby 1898. Proc. Linn. Soc. N. S. Wales, vol. 23, p. 40. (Type species, Platycephalus cirronasus Richardson).

Thysanophrys sp.

2 specimens. 62 and 100 mm. Onotoa lagoon.

D VIII-11; A 12; P 20; scale rows from gill opening to base of caudal fin 55 (1 specimen).

Color from 35 mm Kodachrome transparency in dorsal view light reddish brown, spotted and mottled with white; 3 faint broad reddish brown bands across body, the first from back of head to posterior end of spinous dorsal, the second, narrower, across middle of soft dorsal, and the third, still narrower, on caudal peduncle; a transverse band across head at level of eyes, this band about 1/3 greatest eye diameter; fins with small dark brown blotches.

Interorbital width 2.2 in greatest diameter of eye; margins of lips papillate.

This species will be described as new by Schultz in vol. 2 of Fishes of the Marshall and Marianas Islands.

Family CARACANTHIDAE

Genus CARACANTHUS

Caracanthus Kroyer 1845. Natur. Tidsskr., vol. 1, p. 267. (Type species, Caracanthus typicus Kroyer = Micropus maculatus Gray).

Caracanthus maculatus

Micropus maculatus Gray 1831. Zool. Misc., p. 20. (Type locality, seas of Owaihi and Hao).

1 specimen. 40 mm. Onotoa.

D VIII, 12; A II, 11; P 14.

Color in alcohol brown with black dots on head and body, especially dorsally; 8th dorsal spine about half as long as 3rd dorsal spine; a single knob-like projection on ventro-anterior edge of preorbital spine.

This specimen was secured with rotenone from a poorly-defined surge channel region in the northern part of the atoll.

Caracanthus unipinnus

Micropus unipinnus Gray 1831. Zool. Misc., p. 20. (Type locality, Pacific Ocean).

2 specimens. 12 and 22 mm. Onotoa.

D VIII, 12; A II, 11 or 12; P 12 or 13.

Color in alcohol brown with no spots; 8th dorsal spine only slightly shorter than 3rd dorsal spine; two knob-like projections on ventro-anterior edge of preorbital spine.

Taken at the same poison station as Caracanthus maculatus.

Family BOTHIDAE

Genus BOTHUS

Bothus Rafinesque 1810. Caratteri di alcuni nuovi generi e nuove specie di animali e piante della Sicilia, p. 23. (Type species, Bothus rumulo Rafinesque).

Bothus mancus

Pleuronectes mancus Broussonet 1782. Ichthyologia...,(no pagination), pl. (Type locality, Tahiti).

2 specimens. 43 and 47 mm. Onotoa.

1 specimen. 150 mm. Tarawa.

D 99 to 101; A 77 to 78; scale rows 82 to 84. (3 specimens).

Color in alcohol tan with 3 large black spots widely separated along lateral line, the one in the mid region of the body being the largest and darkest; body and fins covered with small black spots.

Both Onotoa specimens were collected with rotenone from the lagoon over a sandy bottom, one from 11 feet and the other from 6 feet of water.

Bothus pantherinus

Rhombus pantherinus Rüppell 1828. Atlas zu der Reise im nördlichen Afrika, Fische, p. 121, pl. 3, fig. 1. (Type locality, Red Sea).

Bothus pantherinus Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 297. (Nauru).

1 specimen. 102 mm. Onotoa.

1 specimen. 57 mm. Tarawa.

D 89 to 92; A 71 to 72; scale rows 84 (last 4 small). (2 specimens).

Color very similar to Bothus mancus. The usual way to separate these two bothids is to count dorsal and anal fin rays. Schultz (1943) has shown that gill raker counts will effect a separation. A more convenient method lies in the nature of the squamation of the interorbital space. In B. pantherinus this space is entirely scaled except for regions close to the eyes; in B. mancus the anterior half is naked.

The single Onotoa specimen was speared by D. W. Strasburg in a sandy lagoon area of about 5 feet in depth.

Family PLEURONECTIDAE

Genus SAMARISCUS

Samariscus Gilbert 1905. Bull. U. S. Fish Comm., vol. 23, pt. 2, p. 682. (Type species, Samariscus corallinus Gilbert).

Samariscus sp.

1 specimen. 32 mm. Onotoa.

D 64; A 52; P 5; V 5; lateral line scales 70.

Color in alcohol tan with faint, irregular, brown blotches; 3 conspicuous dark brown circles in the midline of the body, the first lying on the lateral line at the level of the end of the pectoral fin, the second just below the lateral line at the level of the 45th dorsal ray, and the last touching the lateral line with the upper rim of the circle at the level of the posterior ends of the soft dorsal and anal fins; dorsal, anal, and caudal fins pale with scattered small dark brown spots; outer half of pectoral fin rays black.

The one small specimen was taken with rotenone in the lagoon over sand in 11 feet of water.

This species will be described by Woods in vol. 2 of *Fishes of the Marshall and Marianas Islands*.

Family ECHENEIDAE

Genus ECHENEIS

Echeneis Linnaeus 1758. Syst. nat., ed. 10, p. 260. (Type species, *Echeneis naucrates* Linnaeus).

Echeneis naucrates

Echeneis naucrates Linnaeus 1758. Syst. nat., ed. 10, p. 260. (Type locality, Pelago Indico).

Leptecheneis naucrates Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 299. (Nauru).

Family GOBIIDAE

An estimated 11 species of gobies were collected by the author in the Gilbert Islands. These have been turned over to Dr. Ernest A. Lachner of the United States National Museum who will include them in his write-up of the Gobiidae for volume 2 of *Fishes of the Marshall and Marianas Islands*. Among the field identifications were the following: *Bathygobius fuscus*, *Mucogobius slateri*, *Amblygobius phalaena*, *Gnatholepis knighti*, *Fusigobius neophytus*, and *Gobiodon citrinus*.

Family ELEOTRIDAE

An estimated five species of eleotrids were turned over to Dr. Ernest A. Lachner of the United States National Museum in order that they might be incorporated with Bikini material for volume 2 of *Fishes of the Marshall and Marianas Islands*. Field identifications of two of the species are *Valenciennea strigata* (= *Eleotriodes strigatus*) and *Valenciennea violifera* (= *Eleotriodes sexguttatus*).

Family BROTULIDAE

Genus BROTULA

Brotula Cuvier 1829. Règne animal, ed. 2, vol. 2, p. 335. (Type species, *Enchelyopus barbatus* Bloch and Schneider).

Brotula multibarbata

Brotula multibarbata Temminck and Schlegel 1846. Fauna Japonica. Pisces, p. 251, pl. 111, fig. 2. (Type locality, Simabara Bay, Japan).

6 specimens. 143 - 200 mm. Onotoa.

D 128 to 130; A 104 to 106; P 25; V 2; barbels on snout 6; barbels on chin 6 (2 specimens).

Color in alcohol grayish brown with very faint narrow lengthwise dark lines on body; outer half of dorsal and anal fins black, margin white.

Posterior part of body ends in a gradually tapering point, and dorsal and anal fin rays are not separable from caudal rays (dorsal and anal fin rays were counted to posterior tip of body); eye about 4 in head length; depth of body 5 to 6 in total length.

No specimens of Brotula townsendi Fowler were taken.

Genus DINEMATICHTHYS

Dinematichthys Bleeker 1855. Nat. Tijdschr. Ned.-Ind., vol. 8, pp. 306, 319. (Type species, Dinematichthys iluocoeteoides).

Dinematichthys iluocoeteoides

Dinematichthys iluocoeteoides Bleeker 1855. Nat. Tijdschr. Ned.-Ind., vol. 8, p. 319. (Type locality, Batu Archipelago).

22 specimens. 35 - 79 mm. 1 specimen. 130 mm. Onotoa.

7 specimens. 43 - 65 mm. Tarawa.

D 72 to 83; A 59 to 65; P 21 to 24; V 2. (6 specimens).

Color in alcohol light grayish to yellowish brown with 3 narrow yellowish longitudinal stripes faintly visible on side of body. Color in life variable, either orange, yellow, or gray.

Specimens were taken from numerous shallow water habitats.

There was no tendency for grouping fin ray counts among the 6 specimens checked, and it is assumed that all specimens except possibly the 130 mm one represent one highly variable species. The 130 mm specimen, bright yellow with reddish fins in life, and 7 smaller specimens were sent to Boyd W. Walker of the University of California at Los Angeles who is working on this group of fishes.

Family PARAPERCIDAE

Genus PARAPERCIS

Parapercis Bleeker. 1863. Ned. Tijdschr. Dierk., vol. 1, p. 236. (Type species, Sciaena cylindrica Bloch = Percis cylindrica Cuvier and Valenciennes).

Parapercis cephalopunctatus

Percis cephalopunctatus Seale 1901. Occ. Pap. B. P. Bishop Mus., vol. 1, p. 124. (Type locality, Guam).

10 specimens. 87 - 122 mm. Onotoa.

D IV,21; A I,17; P 17; scale rows from upper end of gill opening to base of caudal fin 60 or 61; gill rakers 14 and 16. (2 specimens).

Color from 35 mm Kodachrome transparency white with 9 vertical reddish brown bars on the side of the body, each broadest below lateral line, and all connected by reddish brown region on back and by a narrow blackish line below lateral line; a blackish spot at lower base of pectoral fin; a large blackish area centro-basally in caudal fin; 5 brownish spots in a horizontal line from tip of lower jaw to cheek; dorsal and caudal fins with small blackish spots.

Most of the specimens were taken in sandy areas of the lagoon.

Family BLENNIIDAE

The blennies are here considered in two subfamilies, the Petroscirtinae and the Salariinae. Species of the former group are generally longer bodied, have gill membranes broadly attached to the isthmus, a somewhat pointed snout and ventral mouth, and an exceedingly large canine tooth posteriorly on each side of the lower jaw. The salarian blennies are usually more robust in form (though many are quite elongate), have gill membranes free from the isthmus, a blunt snout, and lack the large canine teeth. This group, along with the gobies, dominated the tide pools of the reef flat at Onotoa and were common in other environments as well.

The identifications and counts on all of the Onotoa Blenniidae and Tripterygiidae were made by D. W. Strasburg, now of Duke University. His able help in this regard was greatly appreciated. All of the blennies listed below without specific names may represent undescribed forms; these have been sent to Strasburg.

Subfamily PETROSCIRTINAE

Genus RUNULA

Runula Jordan and Bollman 1890. Proc. U. S. Nat. Mus., vol. 12, p. 171. (Type species, Runula azalea Jordan and Bollman).

Runula tapeinosoma

Petroskirtes tapeinosoma Bleeker 1857. Act. Soc. Sci. Indo-Neerl., vol. 2, p. 64. (Type locality, Ambon, East Indies).

5 specimens. 49 - 61 mm. Onotoa.

D VIII, 35 or 36; A II, 30. (5 specimens).

Color in life: a broad black band from snout through eye to base of caudal fin and narrowing out on caudal fin rays, this band broken up into blotches on about anterior two-thirds of body; body greenish above this band, whitish below: a small yellow spot at base of caudal fin just above median dark band; dorsal fin with a narrow pale margin and a black submarginal band; anal fin dusky with narrow pale margin.

This slender little fish often made its presence known by direct attack on a swimmer. The bite was usually barely perceptible for the teeth could not normally be inserted; nevertheless this behavior was distinctly annoying.

Genus ASPIDONTUS

Aspidontus Quoy and Gaimard 1834. Voyage "Astrolabe", Zool., vol. 3, p. 719. (Type species, Aspidontus taeniatus Quoy and Gaimard).

Aspidontus taeniatus

Aspidontus taeniatus Quoy and Gaimard 1834. Voyage "Astrolabe", Zool., vol. 3, p. 719, pl. 19, fig. 4. (Type locality, Guam and northern New Guinea).

2 specimens. 54 and 57 mm. Onotoa.

D XI, 27 or 28; A II,26; P 14. (2 specimens).

Color in life bright blue with a black band running from snout through eye down middle of side of body to end of caudal fin, this band becoming broader posteriorly such that the caudal fin is entirely black except upper and lower lobes which are narrowly blue.

See further remarks on this species under the labrid species *Labroides dimidiatus*.

Genus MEIACANTHUS

Meiacanthus Norman 1943. Ann. Mag. Nat. Hist. ser. 11, vol. 10, p. 805. (Type species, *Petroscirtes oualensis* Günther).

Meicanthus atrodorsalis

Petroscirtes atrodorsalis Günther 1877. Jour. Mus. Godeffroy, vol. 4, pt. 13, p. 198, pl. 115, fig. B. (Type locality, Samoa).

2 specimens. 36 and 46 mm. Onotoa lagoon.

D IV, 26 or 27; A II, 16 or 17; P 14. (2 specimens).

Color in life brilliant dark blue-green with caudal peduncle, caudal fin, and caudal filaments bright yellow; a black band at base of dorsal fin.

Genus PETROSCIRTES

Petroscirtes Rüppell 1828. Atlas Reise nördlichen Afrika, vol. 4, p. 110. (Type species, *Petroscirtes mitratus* Rüppell).

Petroscirtes sp.

2 specimens. 37 and 42 mm. Onotoa lagoon.

D IX, 28; A II, 22 or 23; 7 or 8 chin barbels. (2 specimens).

Color in life: anterior half of body blue dorsally shading to purple ventrally; posterior half bright yellow.

This species is tentatively placed in the genus *Petroscirtes*. It could not properly be included in any of the genera of the subfamily as defined by Norman (1943). It has a body depth about 6 in standard length; the gill opening is small and just above base of pectoral; the dorsal profile of the head is steep and uniformly convex; the interorbital is slightly wider than eye diameter; the anterior edge of the lower jaw is transversely truncate.

Subfamily SALARIINAE

Genus CIRRIPECTUS

Cirripectus Swainson 1839. Nat. hist. and class. fishes, amphibians,... vol. 2, pp. 79, 80 (Cirripectes on pp. 182, 275). (Type species, Salarias variolosus Cuvier and Valenciennes).

Cirripectus variolosus

Salarias variolosus Cuvier and Valenciennes 1836. Hist. nat. poiss., vol. 11, p. 317. (Type locality, Guam).

3 specimens. 57 - 59 mm. Onotoa.

D XII,14; A II,15. (3 specimens).

Color in alcohol reddish brown with a few tiny pale spots anteriorly on head; fins dusky except anterior part of dorsal, outer upper part of caudal, and pectoral membranes.

Cirripectus sebae

Salarias sebae Cuvier and Valenciennes 1836. Hist. nat. poiss., vol. 11, p. 323.

8 specimens. 30 - 48 mm. Onotoa.

3 specimens. 22 - 38 mm. Tarawa surge channel.

D XII, 14; A II, 14. (2 specimens).

Color in alcohol brown with vertical dark brown bars; head with a faint reticulated pattern of whitish lines. One small specimen has a lengthwise black band along side of body from upper edge of gill opening to caudal fin. In another specimen with a similar band, vertical bars are forming ventrally from the band.

Cirripectus quagga

Rupiscartes quagga Fowler and Ball 1924. Proc. Acad. Nat. Sci. Phila., vol. 76, p. 273. (Type locality, Wake Island).

6 specimens. 47 - 59 mm. Onotoa.

D XII, 15; A II, 16. (2 specimens).

Color in alcohol brown with vertical dark brown bars on side of body; some specimens with numerous small pale spots; head with irregular dark lines and pale spots.

Cirripectus jenningsi

Cirripectes jenningsi Schultz 1943. Bull. U. S. Nat. Mus. 180, pp. 273, 274, fig. 27. (Type locality, Swains Island).

1 specimen. 76 mm. Onotoa.

D XII, 15; A II, 16.

Color in alcohol: anterior half of body tan with 2 vertical dark brown bars running from dorsal fin toward abdomen; posterior half of body dark brown; body covered with small whitish spots (more evident on dark brown portions); head with small dark spots (also faintly evident on anterior half of body).

Cirripectus fuscoguttatus

Cirripectus fuscoguttatus Strasburg and Schultz 1953. Jour. Washington Acad. Sci., vol. 43, pp. 129, 130, fig. 1. (Type locality, Rongerik Atoll, Marshall Islands).

2 specimens. 60 and 79 mm. Onotoa.

D XII, 14; A II, 15.

The two specimens were used as paratypes by Strasburg and Schultz.

Cirripectus stigmaticus

Cirripectus stigmaticus Strasburg and Schultz 1953. Jour. Washington Acad. Sci., vol. 43, pp. 130, 132, fig. 2. (Type locality, Rongerik Atoll, Marshall Islands).

16 specimens. 36 - 76 mm. Onotoa.

D XII, 15; A II, 16.

These specimens were used as paratypes by Strasburg and Schultz.

Cirripectus sp.

4 specimens. 30 - 66 mm. Onotoa.

D XII, 14; A II, 15 or 16. (4 specimens).

Color in alcohol: body and fins uniform dark brown.

This species is distinctive in lacking a notch in the dorsal fin between the spinous and soft portions.

Genus RHABDOBLENNIUS

Rhabdoblennius Whitley 1930. Mem. Queensland Mus., vol. 10, p. 20. (Type species, *Blennius rhabdotrachelus* Fowler and Ball).

Rhabdoblennius snowi

Blennius snowi Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 431, fig. 71. (Type locality, Strong's Island, Caroline Islands).

Nixiblennius snowi Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 298 (Nauru reef flat).

20 specimens. 14 - 42 mm. Onotoa.

D XII, 19; A II, 19. (2 specimens).

Color in alcohol light tan with 7 white marks in linear series on side of body, the anterior 4 or 5 each in the form of the letter "H"; most specimens with irregular dark brown blotches especially anteriorly on body; head with widely-scattered small white spots.

All of the specimens were collected from the highest tide pools of the outer reef flat which are normally covered by high tide.

Rhabdoblennius sp.

2 specimens. 22 and 23 mm. Onotoa.

D XII, 15 or 16; A II, 17 or 18.

Color in alcohol light brown with 2 lengthwise rows of about 12 brownish spots down the side of the body (these spots tend to be arranged in groups of 4); 2 irregular oblique dark brown lines on head behind eye which join below eye and continue on to chin; a dark brown spot ventrally on gill membranes just anterior to base of pelvic fin; anterior part of head and upper lip with a concentration of dark pigment spots.

Body elongate, its depth contained about 6.5 times in standard length; one broad simple nuchal cirrus on each side; anterior nostril with a tubular rim, one edge of which is produced into a broad, simple flap; a median cephalic crest with a dark brown spot in its center (and an anterior and posterior spot as well in the larger specimen).

The two specimens were collected by use of rotenone on the outer reef in an area of the northern part of the atoll with numerous small heads of coral reaching to within a foot of the surface; maximum depth of the water was 7 feet.

Genus ISTIBLENNIUS

Istiblennius Whitley 1943. Australian Zool., vol. 10, p. 185. (Type species, Salarias müller Klunzinger).

Istiblennius edentulus

Blennius edentulus Bloch and Schneider 1801. Systema ichth., p. 172. (Type locality, Huahine Island, Society Islands).

Salarias edentulus Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 298. (Nauru).

5 specimens. 35 - 81 mm. Onotoa.

5 specimens. 51 - 92 mm. Tarawa.

1 specimen. 53 mm. Nukunau.

D XIII, 19 to 21; A II, 21 or 22. (4 specimens).

Color in alcohol brown with pairs of vertical dark brown bars on the side of body; median fins darker than body.

All specimens from tide pools of outer reef flat.

Istiblennius lineatus

Salarias lineatus Cuvier and Valenciennes 1836. Hist. nat. poiss., vol. 11, p. 314. (Type locality, Java).

8 specimens. 31 - 108 mm. Onotoa.

D XIII, 22 to 24; A II, 22 to 24. (8 specimens).

Color in alcohol light brown with pairs of brown spots on back adjacent to dorsal fin and in line with these on the side brown bars which follow myotome contours; about 10 or 12 small dark brown spots on side of caudal peduncle; fins light brown.

The specimens were collected from tide pools on the outer reef flat.

Istiblennius paulus

Salarias paulus Bryan and Herre 1903. Occ. Pap. B. P. Bishop Mus., vol. 2, p. 136. (Type locality, Marcus Island).

Salarias periophthalmus Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 299. (Nauru).

12 specimens. 18 - 69 mm. Onotoa.

D XIII, 19 or 20; A II, 20 or 21. (5 specimens).

Color in alcohol tan with about 7 brownish "H" shaped marks in linear series on side of body, the upper part of the "H" less distinct; two tiny elliptical dark-edged white spots, one above the other, within each "H" shaped mark; soft dorsal fin with basal half dusky, outer half pale; anal fin with outer one-third dusky, inner two-thirds pale; lower portion of caudal fin dusky (orangish in life), upper half pale.

This species was taken both from tide pools of the outer reef flat and in deeper water (about 5 feet) of the outer reef and lagoon.

Istiblennius gibbifrons

Salarias gibbifrons Quoy and Gaimard 1824. Voyage autour du monde..."Uranie"...Zool., p. 253. (Type locality, Hawaiian Islands).

3 specimens. 35 - 57 mm. Onotoa.

D XIII, 18 or 19; A II, 19 or 20. (3 specimens).

Color of female specimen in alcohol light tan with very faint irregular vertical dark markings on side of body; a jet black spot on fin membrane between first 2 dorsal rays; dorsal and caudal fins pale with small black spots forming irregular lines.

The specimens were collected from tide pools and water up to 7 feet in depth on the outer reef.

Family TRIPTERYGIIDAE

Genus TRIPTERYGION

Tripterygion Risso 1826. Hist. Nat. Eur. Merid., vol. 3, p. 241. (Type species, Tripterygion nasus Risso).

Tripterygion minutus

Tripterygium minutum Günther 1877. Jour. Mus. Godeffroy, vol. 4, pt. 13, p. 211. (Type locality, Apia, Samoa).

5 specimens. 15 - 18 mm. Onotoa.

D III-XI-9; anterior lateral line pores 13 or 14. (5 specimens).

Color in alcohol pale with tiny small black spots (melanophores) on body and fins, most concentrated on edges of body scales, caudal fin, anal fin, and ventral half of head and chest.

This small species was taken in tidepools on the outer reef flat about 200 feet from shore.

Genus HELCOGRAMMA

Helcogramma McCulloch and Waite 1918. Rec. South Australian Mus., vol. 1, p. 57. (Type species, _Helcogramma_ _decurrens_ McCulloch and Waite).

Helcogramma sp.

4 specimens. 30 - 31 mm. Onotoa.

D III-XIII or XIV-11 or 12; A I, 20 or 21; P 16. (4 specimens); anterior lateral line scales 25. (2 specimens); posterior scales 14; oblique scale rows 39. (1 specimen).

Color in life light brown with 7 pairs of vertical red lines on each side of body extending from mid-dorsal line about four-fifths the body depth (the members of each pair of lines tend to meet ventrally); head blackish due to numerous black dots (except occipital region which is bright red); eyes red.

The species was taken in two different localities at the atoll; one was in the lagoon near the west reef with considerable coral and in 11 feet of water; the other was a similar region though on the outer reef, the depth being 8 feet.

These specimens have been sent to D. W. Strasburg at Duke University who believes they may represent an undescribed species.

Family CARAPIDAE

Genus CARAPUS

Carapus Rafinesque 1810. Indice d'ittiologia sicilana...pp. 37, 57. (Type species, _Gymnotus_ _acus_ Linnaeus).

Carapus homei

Oxybeles homei Richardson 1846. Ichthyology voyage "Erebus" and "Terror", p. 74, pl. 44, figs. 7 - 19. (Type locality, seas of Australia? and Timor).

7 specimens. 70 - 127 mm. Onotoa.

Color in alcohol uniform pale yellowish. Pectoral rays counted as 17. 3 elongate gill rakers on upper part of first arch, remaining rakers rudimentary. 3 stout teeth in midline on vomer with small teeth in a single row on either side; 2 rows of teeth on palatine; teeth in jaws in 2 rows, those near symphysis about 2 or 3 times longer than remaining teeth.

Six of the specimens were brought to me by Gilbertese children; when queried as to how the fish were collected, they replied that they were taken from sea cucumbers in the lagoon.

One specimen of this species, 90 mm in length, was inadvertently collected by P. E. Cloud at Onotoa. He picked up a sea urchin with long banded spines (either Diadema or Echinothrix) and placed it in a face plate. Later the little pearl fish was discovered in the same face plate. Because of the habits of these fishes, it was at first assumed that this individual fish had been inside the test of the urchin when it was picked up. In view of the difficulty in visualizing a means of exit from an echinoid, especially one small enough to fit into a face plate, I now believe the fish might have hidden among the spines of the urchin when it was collected. Dr. Cloud, however, still suspects that the fish may have been within the urchin and somehow managed to extricate itself.

Family BALISTIDAE

The trigger fishes, with their unusual structure, bright color, and peculiar mode of swimming by undulation of the soft dorsal and anal fins, proved to be a prominent group of fishes on Gilbert Island reefs. They were always seen as solitary individuals and were usually wary of an observer. The natives referred to species in this family as te bubu. Most are readily caught with hook and line.

At Onotoa Rhinecanthus aculeatus was the most abundant in typical lagoon areas while Balistapus undulatus generally predominated elsewhere. The distinctive Rhinecanthus rectangulus was commonly seen on the outer reef, seeking refuge in very small holes in the reef when approached.

Only six species were taken at Onotoa. Another, Melichthys vidua, was often seen underwater at this atoll. It was previously collected by Andrew Garrett at Abaiang and reported by Günther (1910). Also collected by Garrett from the Kingsmill Islands were *Pseudobalistes fuscus* and *Sufflamen chrysoptera*.

Odonus niger, *Balistoides niger* (= *B. conspicillum*), *Pseudobalistes flavimarginatus*, and *Sufflamen bursa* were not seen nor are they recorded from the Gilbert Islands, but these species, and possibly others, may occur there.

Key to the Species of Balistidae Recorded from the Gilbert Islands

1a. A short groove running forward below the nostrils from the most anterior part of eye........................2

1b. No groove running forward from eye......................8

2a. Third dorsal spine not visible in elevated fin; ventral profile from mouth to pelvic spine prominently convex..3

2b. Third dorsal spine readily visible in elevated fin; ventral profile from mouth to pelvic spine straight or only slightly convex............................5

3a. A series of 5 long oblique grooves on cheek, the 3 central ones most prominent; body depth not great, 2.5 in standard length; color of body in alcohol light brown with a single round brown spot on each scale.............................*Xanthichthys ringens*

3b. No series of long grooves on cheek; body depth great, about 2 in standard length; color of body very dark brown to black...4

4a. A series of 8 to 10 conspicuous lengthwise ridges on posterior third of body; caudal fin lunate; all fins dark except a narrow pale (light blue in life) line at the base of the soft dorsal and anal fins...*Melichthys buniva*

4b. No series of conspicuous lengthwise ridges on posterior third of body; caudal fin double emarginate to truncate; pectoral fin pale (light yellow in life), soft dorsal and anal fins white with narrow black margins, caudal fin pale (in life with basal third white and distal two-thirds bright salmon-pink)...*Melichthys vidua*

5a. No rows of spines on caudal peduncle; head naked anteriorly, scaled posteriorly; 4 short horizontal grooves on cheek; soft dorsal and anal fins markedly elevated anteriorly; caudal fin with prolonged pointed upper and lower lobes; margins of pectoral, soft dorsal, anal, and caudal fins abruptly pale...*Pseudobalistes fuscus*

5b. Rows of small forward-projecting spines on caudal peduncle; head completely scaled; no horizontal shallow grooves on cheek; soft dorsal and anal fins not markedly elevated anteriorly; margins of pectoral, soft dorsal, anal, and caudal fins not abruptly pale..6

6a. Dorsal profile of head from mouth to origin of spinous dorsal fin slightly convex; body with dorsal saddle-like black areas extending midlaterally; eye large, contained about 4 times (3 in young) in distance from snout to upper end of gill opening; caudal fin markedly rounded...............*Balistoides viridescens*

6b. Dorsal profile of head almost straight; dorsal part of body without any saddle-like black areas; eye relatively small, contained about 5 to 5.5 times in the distance from the snout to the upper end of the gill opening; caudal fin slightly rounded or slightly emarginate...7

7a. Caudal fin slightly rounded; caudal fin uniform brown in color; membrane of spinous dorsal fin extends to tip of first dorsal spine, the free edge of this membrane being almost straight....*Sufflamen capistrata*

7b. Caudal fin slightly emarginate; caudal fin very dark brown with broad white crescentic marginal area posteriorly and narrower white marginal areas dorsally and ventrally; membrane of the spinous dorsal fin does not extend to extreme tip of first dorsal spine, and the free edge of this membrane is distinctly concave..........................*Sufflamen chrysoptera*

8a. Third dorsal spine large, that seen above dorsal body profile contained .4 to .8 times in greatest diameter of eye; spines on caudal peduncle large, irregularly arranged in 2 short rows, and contained in a large round black area; body dark brown with numerous narrow sweeping pale (orange in life) lines...*Balistapus undulatus*

8b. Third dorsal spine minute, not visible or only barely visible above dorsal body profile; spines on caudal peduncle small, linearly arranged in 3 to 4 rows, and not contained in a round black area; body pale to light brown with distinctive black markings.......9

9a. Spines on caudal peduncle in 4 horizontal rows, the upper row about half the length of the lower 3; spines on caudal peduncle contained in a triangular black area, the anterior point of which terminates at about the level of the 8th dorsal ray...Rhinecanthus rectangulus

9b. Spines on caudal peduncle in 3 horizontal rows, the lowermost of which is less than half the length of the upper 2; spines on caudal peduncle not contained in a triangular black area......Rhinecanthus aculeatus

Genus XANTHICHTHYS

Xanthichthys (ex Kaup) Richardson 1856. Encycl. Brit., ed. 8, vol. 12, p. 313. (Type species, Balistes curassavicus Gmelin 1788 = Balistes ringens Linnaeus 1758).

Xanthichthys ringens

Balistes ringens Linnaeus 1758. Syst. nat., ed. 10, vol. 1, p. 329. (Type locality, Ascension Island).

Xanthichthys ringens Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 299. (Nauru).

Genus MELICHTHYS

Melichthys Swainson 1839. The nat. hist. and class. fishes, amphibians,...,vol. 2, pp. 194, 325. (Type species, Balistes ringens Bloch = Balistes buniva Lacépède 1803).

Melichthys buniva

Balistes buniva Lacépède 1803. Hist nat. poiss., vol. 5, pp. 668, 669, pl. 21, fig. 1.

Balistes radula Solander, in Richardson 1848. Zool. "Samarang", p. 22.

3 specimens. 106 - 215 mm. Onotoa.

Color in life dark blue-green with black longitudinal lines; a narrow bright light blue line at base of the soft dorsal and anal fins, this line being slightly broader posteriorly. Blue lines radiate dorsally and anteriorly from the eye. Just visible in the dark caudal fin is a somewhat darker submarginal vertical line, faintly edged in light blue, which curves posteriorly to extend to the ends of the somewhat prolonged upper and lower lobes of the caudal fin. Immediately upon death the fish takes on a uniform greenish black hue, thus obliterating the longitudinal lines on the body; the blue lines radiating from the eye disappear. The most conspicuous color, the light blue line at the base of the soft dorsal and anal fins, remains, ultimately fading to white in preserved specimens.

All specimens were speared on the coralliferous terrace of the outer reef, the only habitat where they were seen. They were often observed well above the coral-covered bottom. Rapid swimmers for balistids, they usually moved swiftly away from an area intruded by a swimmer.

There has been considerable confusion with respect to the correct name for this circumtropical species. Three specific names have been in common use, buniva, radula, and ringens. The ringens of Linnaeus (1758) is clearly not this species, for he mentioned the three grooves on the cheek such as we see in the Atlantic Xanthichthys, and these are not present in Melichthys. The name buniva Lacépède predates radula Solander.

Melichthys vidua

Balistes vidua Solander, in Richardson 1844. Zool. "Sulphur", Fishes, p. 128, pl. 59, figs. 9, 10. (Type locality, Tahiti).

Melichthys vidua Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 299. (Nauru).

An elusive species at Onotoa, it was frequently seen on the coralliferous terrace of the outer reef near the entrance to surge channels. It avoided capture by retiring to deep recesses in the reef. A specimen procured in the Marshall Islands provided the following color description: body purplish black; basal third of caudal fin snow white, distal two-thirds bright salmon pink; pectoral fin clear yellow; soft dorsal and anal fins edged in black; within the black margins fin rays white, membranes hyaline; spinous dorsal fin black; lips faintly reddish; iris yellow.

Genus PSEUDOBALISTES

Pseudobalistes Bleeker 1866. Ned. Tijdschr. Dierk., vol. 3, p. 11. (Type species, Balistes flavimarginatus Rüppell).

Pseudobalistes fuscus

Balistes fuscus Bloch and Schneider 1801. Systema ichth., p. 471 (on Le Baliste grande-tache Lacépède 1799).

Balistes chrysospilus Bleeker 1865. Atlas ichth., vol. 5, p. 111, pl. 225, fig. 3.

Balistes fuscus Günther 1910. Jour. Mus. Godeffroy, vol. 9, pt. 17, p. 442, pl. 168. (Kingsmill Islands).

Genus BALISTOIDES

Balistoides Fraser-Brunner 1935. Ann. Mag. Nat. Hist., ser. 10, vol. 15, p. 662. (Type species, Balistes viridescens Bloch).

Balistoides viridescens

Balistes viridescens Bloch and Schneider 1801. Systema ichth., p. 477 (on Le Baliste verdatre Lacépède 1799). (Type locality, Mauritius).

6 specimens. 23 - 29 mm. Onotoa.

Color of juveniles in life light golden with scattered dark brown spots on head and body. A faint dark area occurs beneath the soft dorsal fin; a similar blotch can be seen adjacent to the base of the spinous dorsal fin; dorsal, anal, and pectoral fins unspotted except in the largest specimen which possesses 3 faint spots in the soft dorsal fin; caudal fin dusky with small blotches centrally.

These small specimens were identified as viridescens on the basis of fin ray counts which were consistent with those of specimens from the Philippines, East Indies, Samoa, and the Marshall Islands and by comparison with progressively larger specimens from these areas which gradually assume typical adult coloration. An 80 mm specimen from the Philippines displayed the characteristic broad dark band extending and narrowing posteriorly from the upper lip and containing a thin pale line. Bleeker has portrayed this species in color as Figure 2 of Plate 131 in Volume 5 of his Atlas Ichthyologique (1865).

5 specimens (22-23 mm) were collected by hand in a sandy channel region where the water was only a few inches deep. The 29 mm specimen was secured with rotenone from a depth of about 5 feet in the Onotoa lagoon.

Adults are stated by Günther (1910) to reach a length of 2 feet. A specimen of nearly this size from the Line Islands, erroneously identified as fuscus, is present in the Bernice P. Bishop Museum, Honolulu. The adults were not infrequently seen in the Onotoa lagoon well out of spearing range. It is possible, however, that they might be confused at this distance with P. fuscus or P. flavimarginatus which also reach large size.

Genus SUFFLAMEN

Sufflamen Jordan 1916. Copeia, no. 29, p. 27. (New name for Pachynathus Swainson 1839, preoccupied). (Type species, Balistes capistratus Shaw).

Sufflamen capistrata

Balistes capistratus Shaw 1804. General Zoology, vol. 5, pt. 2, p. 417 (on Le Baliste bride Lacépède 1799). (Type locality, Indian Ocean).

Sufflamen fraenatus Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 299. (Nauru).

1 specimen. 135 mm. Onotoa.

Color from 35 mm Kodachrome transparency brownish gray; proximal half of lower lip bright yellow; remainder of this lip and upper lip bluish; a pale line on chin extending upwards almost to rictus; spinous dorsal and caudal fins dark brown, the former fin with a black spot distally in the fin membrane; pectoral, soft dorsal, and anal fins brownish, becoming yellowish distally.

A second line under the chin and a prominent line extending from the rictus almost to the base of the pectoral fin were not present in the Onotoa specimen. Such markings are shown in Lacépède's plate and are included in Shaw's description. The absence of such markings, however, is considered within the variability of this species by Fowler (1928).

Sufflamen chrysoptera

Balistes chrysopterus Bloch and Schneider 1801, Systema ichth., p. 466 (on Le Baliste armé Lacépède 1799). (Type locality, Indian Ocean).

Balistes niger Günther, 1910, Jour. Mus. Godeffroy, vol. 9, pt. 17, p. 439. (Kingsmill Islands).

Genus BALISTAPUS

Balistapus Tilesius 1820. Mem. Acad. Imp. Sci. St. Petersburg, vol. 7, p. 306. (Type species, Balistapus capistratus Tilesius 1820 = Balistes undulatus Mungo Park 1797).

Balistapus undulatus

Balistapus undulatus Mungo Park 1797. Trans. Linn. Soc. London, vol. 3, p. 37. (Type locality, Sumatra).

6 specimens. 32 - 153 mm. Onotoa.

Color from 35 mm Kodachrome transparency metallic bluish brown with about 20 narrow bright orange lines, occasionally broken, running somewhat irregularly in a diagonal fashion across body antero-dorsally to postero-ventrally; a broad orange line extending from above upper lip diagonally across chest to pelvic spine (this line is joined at about the level of the eye with a similar orange line which circles the chin); a third and narrower orange line runs above and just parallel to the first; lower lip with a broad orange line; a round, jet black area surrounding caudal peduncle spines; spinous dorsal fin dusky with a prominent black spot distally in the membrane between the first and second dorsal spines, and a lesser black spot in the next interspinous membrane; rays of soft dorsal and anal fins orange, membranes clear; caudal fin rays dark brown; membranes of caudal fin orange in dorsal and ventral part of the fin, yellowish centrally. Some variability in color pattern, especially of the orange lines on the body, was apparent from specimen to specimen.

The 32 mm specimen, displaying the juvenile balistid feature of a relatively long first dorsal spine, has a color pattern very similar to that of adult fish. Instead of about 20 oblique orange lines on the body, however, it has 8.

B. undulatus was probably the most abundant balistid at Onotoa and was taken from outer reef, lagoon, and channel areas.

The stomach and intestinal contents of 8 adult specimens from Onotoa were examined. Only one contained a fish, this being in the forepart of the stomach and probably a prior victim to rotenone than the balistid itself. Three specimens had eaten largely green algae; one of these had a good-sized brachyuran crab, another a number of small *Acropora* fragments, and posteriorly in the intestine of the third were the broken spines and test of a sea urchin. Included also in the green algae were several small sponges, tunicate fragments, an egg mass, a few small foraminifera, and considerable bottom debris. Three other specimens contained mostly the coralline red alga *Jania*, one of these having in the posterior part of the stomach a mass of coral fragments. One specimen contained only a little bottom debris and an isopod. The last had made a meal of what appears to be a large polychaete.

It seems, therefore, that this species does not have specialized food habits, but is a rather general bottom feeder. By virtue of its rugged dentition it is able to cope with such unusual food items as coral and sea urchins. In spite of the preponderance of algae in some specimens it is doubtful if algae constitutes important food to the species, for the gut is very short.

Genus RHINECANTHUS

Rhinecanthus Swainson 1839. Nat. hist. and class. fishes, amphibians,..., vol. 2, pp. 194, 325. (Type species, Balistes aculeatus Linnaeus).

Rhinecanthus rectangulus

Balistes rectangulus Bloch and Schneider 1801. Systema ichth., p. 465 (on Le Baliste écharpe Lacépède 1799). (Type locality, Indian Ocean).

3 specimens. 26 - 86 mm. Onotoa.

2 specimens. 97 and 114 mm. Tarawa.

Color from 35 mm Kodachrome transparency light brown, shading to white ventrally on head, chest, and abdomen; a black band extending diagonally from eye, becoming broader just before reaching pectoral fin, and angling more sharply backward at this location to end in midventral line at anterior two-thirds of anal fin and a short distance before this fin; a broad blue band across interorbital space containing 3 black lines; three blue lines extend diagonally downward from eye to pectoral region, 2 of these serving as margins to the previously mentioned black band at this location; a blue line over upper lip; a large triangular black area on caudal peduncle margined with golden lines; slightly removed from, but in alignment with the anterior pointed portion of this black area is a second golden line, the lower limb of which lies adjacent to the upper edge of the broad diagonal black band which extends from pectoral region to anal fin area; red line at base of pectoral fin rays; pectoral, soft dorsal, and anal fins pale, spinous dorsal and caudal fins dusky.

The 26 mm specimen has typical adult coloration.

This species was observed and taken only in the outer reef area.

Rhinecanthus aculeatus

Balistes aculeatus Linnaeus 1758. Syst. nat., ed. 10, p. 328. (Type locality, India).

5 specimens. 28 - 145 mm. Onotoa.

Color from 35 mm Kodachrome transparency: ground color of body light tan above, grading to white ventrally; a black band bordered by blue lines extending from eye to base of pectoral fin; a separate blue line starting from just in front of eye parallels the blue-bordered band and curves to join it at pectoral base; interorbital space blue with 3 black lines running from eye to eye; a large dusky black area centrally on body sending an orangish black band upward to origin of soft dorsal fin and a second dusky branch to posterior part of soft dorsal fin; ventrally the central dusky area is dissected by 4 light blue bands running diagonally back to the anal fin; a 5th band is marginal, running to region of anus; immediate circumanal region black; caudal peduncle spines black and contained within a light blue area; lips bright orange, this color extending broadly from lips to lower base of pectoral fin, narrowing as it approaches this location and displaying a slight hook at the end; a blue line occurs within the orange yellow area just above the upper lip; pectoral, soft dorsal, and anal fins pale; spinous dorsal almost black, caudal fin dusky.

The 28 mm specimen has typical adult coloration.

This species was observed only in sandy lagoon areas around small coral heads.

Table 6 Counts Made on the Balistidae Collected in the Gilbert Islands

Soft rays of the dorsal fin*

	23	24	25	26	27	28	29	30	31	32	33
M. buniva										I	I
B. viridescens				3							
S. capistrata						1					
B. undulatus			3	2							
R. rectangulus	2	2									
R. aculeatus		2	2								

Anal fin rays*

	21	22	23	24	25	26	27	28	29	30
M. buniva									I	I
B. viridescens				3						
S. capistrata					1					
B. undulatus		2	3							
R. rectangulus	4									
R. aculeatus	2	2								

	Scale rows**
M. buniva	54 - 55
S. capistrata	47
B. undulatus	35 - 38
R. rectangulus	33 - 36
R. aculeatus	33 - 36

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*All elements of soft dorsal and anal fins, whether articulated or not, were counted as rays.

**Scale rows were counted from the upper end of the gill opening to the end of the hypural plate. No scale counts could be made for *B. viridescens*, for they were not completely formed in the juvenile specimens which were collected.

Family MONACANTHIDAE

The file fishes were not abundant at Onotoa, with only nine specimens of four species being taken. Garrett collected *Aleutera scripta* at Abemama. The general Gilbertese name for the monacanthids at Onotoa was *te bubuawai*.

Key to the Species of Monacanthidae Recorded from the Gilbert Islands

1a. Caudal fin very large, its length contained about 2.5 times in standard length; dorsal spine small and feeble, contained more than 5 times in standard length; body gray or brown in life with black spots and short curved blue lines..........*Aleutera scripta*

1b. Caudal fin not very large, its length contained 4 to 4.5 times in standard length; dorsal spine not small and feeble, contained 3 to 5 times in standard length; color not as in 1a............................2

2a. Snout long and tubular; mouth very small and directed sharply upwards; gill opening small (less than half an eye diameter in length), vertical, and posterior to eye; body light brown (blue-green in life) and covered with numerous roundish pale (orange in life) spots.....................*Oxymonacanthus longirostris*

2b. Snout not long and tubular; mouth not very small and directed only slightly upwards; gill opening not small (.8 to 2 eye diameters in length), oblique, and not posterior to eye................................3

3a. Dorsal spine with a lateral series of 8 to 12 prominent downward-curved spines; pelvic spine long, with 2 outer articulated portions bearing stout spines; gill opening relatively short (about .8 eye diameters) and contained in a black area; body scales (in specimens over 50 mm) with a vertical series of 3 to 5 large spinules (the central one being about twice as long as adjacent 2), these spinules becoming conspicuously longer on caudal peduncle, giving it a marked brush-like texture...*Pervagor melanocephalus*

3b. Dorsal spine without prominent series of spines; pelvic spine short, without outer articulated portions; gill opening relatively large, 1.2 to 2 eye diameters in length, and not contained in a black area; spinules on body scales small and not as in 3a................4

4a. 4 prominent (at least in adults) anteriorly curved spines in 2 rows on caudal peduncle; caudal fin orange in life.........................*Amanses carolae*

4b. No spines on caudal peduncle; caudal fin grayish-brown in life...................*Amanses sandwichiensis*

Genus ALEUTERA

Aleutera Oken 1817. Isis, p. 1183. (Type species, *Balistes monoceros* Linnaeus).

Aleutera scripta

Balistes scriptus Osbeck 1765. Reise nach Ostindien und China..., p. 145. (Type locality, China Sea).

Monacanthus scriptus Günther 1910. Jour. Mus. Godeffroy, vol. 9, pt. 17, p. 452. (Abemama).

Osbeckia scripta Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 300. (Nauru).

Genus OXYMONACANTHUS

Oxymonacanthus Bleeker 1866. Nat. Tijdschr. Dierk. Amst., vol. 3, p. 13. (Type species, *Oxymonacanthus chrysospilus* Bleeker = *Balistes longirostris* Bloch).

Oxymonacanthus longirostris

Balistes hispidus var. *longirostris* Bloch and Schneider 1801. Systema ichth. p. 464.

1 specimen. 60 mm. Onotoa.

Color in alcohol light brown with 7 series of prominent roundish pale spots on body; short longitudinal pale lines on head; tip of snout pale, this pale area with a black posterior margin; pelvic spine and adjacent area of body black with small pale spots; membrane connecting pelvic spine to body pale; dorsal and anal fins pale; caudal fin pale with 2 vertical dusky bands; central region of posterior caudal dusky band black. Brief color note from life: body bright blue-green with brilliant orange spots.

The single specimen was obtained with rotenone over the west reef of the atoll on the lagoon side in 11 feet of water. It was occasionally sighted in similar areas hovering just over coral knolls.

Genus PERVAGOR

Pervagor Whitley 1930. Australian Zool., vol. 6, p. 120. (Type species, *Monacanthus alternans* Ogilby).

Pervagor melanocephalus

Monacanthus melanocephalus Bleeker 1853. Nat. Tijdschr. Ned.-Ind., vol. 5, p. 95. (Type locality, Lawajong, Solor).

4 specimens. 45 - 68 mm. Onotoa.

Color in alcohol dark brown with faint evidence of narrow longitudinal lines; gill opening surrounded by a black blotch which extends upward to level of eye; region of body between anus and pelvic spine black; soft dorsal and anal fins with numerous, slightly irregular, narrow black lines; caudal fin with numerous, slightly wavy, black lines which parallel the rounded posterior edge of the fin, these lines being absent in central part of fin where a pale crescent-shaped area is visible (this pale area is very indistinct and more anterior in location in the 45 mm specimen, suggesting that it might be absent in smaller specimens). There is definitely no broad submarginal black band in the caudal fin of any specimen. This feature, plus the presence of the black area around the gill opening suggests that these specimens are *Pervagor melanocephalus melanocephalus*. Schultz and Woods will include a discussion of subspecies of *P. melanocephalus* in vol. 2 of *Fishes of the Marshall and Marianas Islands*.

The specimens were obtained with rotenone from lagoon and protected outer reef areas.

Genus AMANSES

Amanses Gray 1832-35. Ill. Indian Zool., vol. 2, pl. 98. (Type species, Monacanthus (Amanses) hystrix Gray = Monacanthus scopas Cuvier).

Amanses carolae

Cantherines carolae Jordan and McGregor in Jordan and Evermann 1899. Rep. U. S. Fish Comm. for 1898. p. 281, pl. 6. (Type locality, Socono Island).

1 specimen. 245 mm. Onotoa.

1 specimen. 192 mm. Tarawa.

Color in life grayish brown with slight yellowish cast ventrally; posterior two-thirds of body with about 12 faint vertical dark brown bands; lips flesh colored, darker on distal margins; bony protuberances bearing caudal peduncle spines orange; dorsal, anal, and pectoral fins pale yellowish, caudal fin orange with dusky rays; iris orange-yellow.

The Onotoa specimen was speared in a recess in coral in about 20 feet of water on the coralliferous terrace of the outer reef.

Amanses sandwichiensis

Balistes sandwichiensis Quoy and Gaimard 1824. Voyage autour du monde..."Uranie", Zool., p. 214. (Type locality, Hawaiian Islands).

Cantherines pardalis Whitley and Colefax 1938. Proc. Linn. Soc. N. S. Wales, vol. 63, p. 299.

3 specimens. 48 - 95 mm. Onotoa.

Color from 35 mm Kodachrome transparency light gray with a faint reticulation of light blue on body and narrow lines on head; a prominent white spot (disappearing in preserved specimens) dorsally on the caudal peduncle at posterior end of the dorsal fin; pectoral, dorsal, and anal fins faintly yellowish; caudal fin dark gray.

The specimens were taken with rotenone on west reef of atoll.

Table 7 Fin Ray Counts of the Monacanthidae Collected in the Gilbert Islands

	Dorsal fin						Anal fin				
	31	32	33	34	35	36	28	29	30	31	32
O. longirostris		1						1			
P. melanocephalus	2	1					2	1			
A. carolae					1	1				1	1
A. sandwichiensis					3					3	

	Pectoral fin (both sides counted)				
	11	12	13	14	15
O. longirostris	2				
P. melanocephalus		4	2		
A. carolae				1	3
A. sandwichiensis		2	4		

Family OSTRACIONIDAE

Genus OSTRARION

Ostracion Linnaeus 1758. Syst. nat., ed. 10, p. 330. (Type species, *Ostracion cubicus* Linnaeus).

Ostracion cubicus

Ostracion cubicus Linnaeus 1758. Syst. nat., ed. 10, p. 332. (Type locality, India).

Ostracion cubicus Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 461. (Abaiang, Kingsmill Islands).

No specimens were collected by me in the Gilbert Islands. Color from 35 mm Kodachrome transparency of a 132 mm specimen which I speared at Arno Atoll in the Marshall Islands: carapace dull yellow with scattered small black spots, more numerous anteriorly; caudal peduncle, fins, and lips bright yellow.

Ostracion meleagris

Ostracion meleagris Shaw 1796. Nat. Misc., vol. 7, pl. 253. (Type locality, Southern Ocean).

Ostracion sebae Günther 1910. Jour. Mus. Godeffroy, vol. 6, pt. 17, p. 454. (Kingsmill Islands).

1 specimen. 83 mm. Onotoa.

D 10; A 10; P 10.

Color from 35 mm Kodachrome transparency dark purplish blue with numerous white dots on carapace, caudal peduncle, and tail; spots on head smaller and less distinct than those on body; dorsal, anal, and pectoral fins hyaline with blackish rays.

This was the only trunk fish taken at Onotoa, and no others were seen.

According to Fraser-Brunner (1940: 391) Ostracion sebae Bleeker is the male form of O. lentiginosus = meleagris). I am unable to sex my specimen for the gonad is very small, but I believe it is a female. The gut is three times as long as the standard length and its contents largely algal (possibly Dictyosphaeria) with bits of bottom sediment. The peritoneum is transparent with scattered small black dots.

Family CANTHIGASTERIDAE

Genus CANTHIGASTER

Canthigaster Swainson 1839. Nat. hist. and class. fishes, amphibians,... vol. 2, p. 194. (Type species, Tetraodon rostratus Bloch).

Canthigaster solandri

Tetrodon solandri Richardson 1845. Zool. voyage "Sulphur", Fishes, p. 125, pl. 57, figs. 4 to 6. (Type locality, Polynesia).

18 specimens. 16 - 62 mm. Onotoa.

1 specimen. 47 mm. Tarawa

D 9; A 9; P 16 or 17 (mostly 17); (8 specimens).

Color from 35 mm Kodachrome transparency reddish tan with numerous small bright blue spots on head and body; blue lines radiating from eye; a black, blue-edged spot beneath dorsal fin; caudal fin orange with bright blue spots arranged in vertical rows; other fins hyaline; throat orange, mid-portion without blue spots.

This was the most abundant sharp-nosed puffer at Onotoa. It was taken in relatively shallow water of lagoon, channel, and outer reef.

Canthigaster jactator

Tropidichthys jactator Jenkins 1901. Bull. U. S. Fish Comm., vol. 19, p. 399, fig. 11. (Type locality, Honolulu).

2 specimens. 52 and 55 mm. Onotoa lagoon.

D 9; A 9; P 17. (2 specimens).

Color in alcohol grayish brown with numerous close-set pale spots on body, somewhat larger and closer together ventrally; dark brown lines radiating from eye and two short diagonal dark lines just beneath dorsal fin; all fins pale without spots.

Canthigaster amboinensis

Psilonotus amboinensis Bleeker 1865. Ned. Tijdschr. Dierk., vol. 2, p. 180. (Type locality, Ambon, East Indies).

5 specimens. 39 - 83 mm. Onotoa.

D 11 or 12 (mostly 12); A 11; P 16 or 17 (mostly 17). (5 specimens).

Color in life dark olive, shading to orange-brown ventrally with small light blue spots and a few brown spots on side of body; light blue lines extending dorsally from eye; dark blue lines ventro-anteriorly from base of pectoral fin; anus and base of anal fin brilliant sapphire blue.

The specimens were collected from rich coral areas of the lagoon near the west reef and from a similar area of the outer reef in the northern part of the atoll.

Family TETRAODONTIDAE

Puffers were infrequently seen in the Gilbert Islands and only four species were collected. The Gilbertese called them all by the name *Tebuni*. They were well aware of the poisonous nature of tetraodont gonads.

Genus AROTHRON

Arothron Müller 1841. Abh. preuss. Akad. Wiss., p. 252. (Type species, *Arothron testudinarius* Müller = *Tetrodon stellatus* Bloch and Schneider).

Arothron hispidus

Tetraodon hispidus Linnaeus 1758. Syst. nat., ed. 10, p. 333. (Type locality, India).

3 specimens. 105 - 199 mm. Onotoa.

1 specimen. 108 mm. Tarawa.

Color from 35 mm Kodachrome transparency grayish brown dorsally with white spots about size of pupil, white ventrally with faint lengthwise yellowish brown lines below pectoral; area around base of pectoral fin and gill opening blackish, with circular white lines; dorsal, anal, and pectoral fins pale yellowish; caudal fin grayish brown with small white spots on basal two-thirds; iris bright orange-yellow.

All of the Onotoa specimens were collected by spearing in a Thalassia area of the lagoon of about 5 feet in depth.

Arothron immaculatus

Tetrodon immaculatus Bloch and Schneider 1801. Systema ichth., p. 507.

Tetrodon immaculatus Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 469. (Kingsmill Islands).

1 specimen. 70 mm. Tarawa.

Color in alcohol grayish brown dorsally shading to light brown ventrally with lengthwise black lines on head and body (two of these lines are confluent in front of gill opening); dorsal, anal, and pectoral fins pale; caudal fin dusky with upper and lower margins dark. Caudal fin long, its length contained 3 times in standard length.

Arothron stellatus

Tetrodon lagocephalus var. stellatus Bloch and Schneider 1801. Systema ichth., p. 503. (Type locality, Mauritius).

Tetrodon stellatus Fowler 1928. Mem. B. P. Bishop Mus., vol. 10, p. 469. (Abaiang, Kingsmill Islands).

Arothron meleagris

Tetrodon meleagris Lacépède 1798. Hist. nat. poiss., vol. 1, p. 505. (Type locality, seas of Asia).

Ovoides meleagris Whitley and Colefax 1938. Proc. Linn. Soc. N. W. Wales, vol. 63, p. 300. (Nauru).

3 specimens. 125 - 160 mm. Onotoa.

Color in life of 125 mm specimen: uniform dark brown with numerous small white spots on head, body, and median fins. A 130 mm specimen was grayish with many small dull yellow spots on dorsal part of body and head and on chin, buff-colored ventrally, with scattered jet black spots on head and body. Color from 35 mm Kodachrome transparency of the 160 mm specimen: bright orange-yellow, whitish ventrally, with an irregular patch of dark brown containing white spots on the right side between dorsal and pectoral fins; dorsal, anal, and pectoral fins with outer one-third whitish, inner two-thirds yellow with rays brownish toward distal part of yellow region; caudal fin yellowish basally, shading to dusky purple over most of fin, and pale distally.

Specimens from both the Gilbert and Marshall Islands, whether yellow, grayish, or brown, have occasional widely-scattered black spots on the head and body, similar to *Arothron nigropunctatus*. The anus is not black, though it may be dusky.

The yellow color phase of *meleagris*, once in preservative with the yellow color faded, can easily be confused with *A. nigropunctatus* which is gray, paler ventrally, with scattered black spots. The two may be separated on fin ray counts (see tabulated counts at end of Tetraodontidae section) and by the coloration of the anus. The anus of *nigropunctatus* is contained within a prominent jet black area.

D. W. Strasburg, in a mimeographed report on the fishes of the southern Marshall Islands submitted to the Office of Naval Research, 1953, should be credited with noticing the higher fin ray counts of *meleagris*. Although he included a specimen of *meleagris* in the yellow color phase under the designation *nigropunctatus*, he suspected that it was a different species because of the higher fin ray counts and pale anus. His yellow specimen lacked the tell-tale patch of *meleagris* coloration which is present on one side of the Onotoa specimen. Another yellow specimen with a small area of *meleagris* coloration was located in the collections of the United States National Museum. It was taken in the northern Marshall Islands. On it the patch of brown with white spots is restricted to the middle of the back.

The 130 mm gray specimen with yellow spots from Onotoa is intermediate in color to the yellow and the brown, white-spotted forms.

Arothron nigropunctatus

Tetrodon nigropunctatus Bloch and Schneider 1801. Systema ichth., p. 507. (Type locality, Tranquebar).

3 specimens. 90 - 169 mm. Onotoa.

Color from 35 mm Kodachrome transparency of 90 mm specimen: dark purplish gray on back, shading to light bluish gray ventrally, with occasional widely-separated black spots of variable size on head and body; dorsal and anal fin rays brownish yellow, membranes hyaline; caudal fin color of body; pectoral fins hyaline; anus jet black.

The gut contents of two of the specimens were examined. They consisted largely of bite-sized pieces of fresh coral.

Table 8 Fin Ray Counts of the Tetraodontidae

	Dorsal fin rays				Anal fin rays			
	9	10	11	12	9	10	11	12
A. hispidus								
Gilbert Is.		3				2	1	
A. immaculatus								
Gilbert Is.		1			1			
A. meleagris								
Gilbert Is.			3				1	2
Marshall Is.			6	1			3	4
A. nigropunctatus								
Gilbert Is.		3				2	1	
Marshall Is.		6	1			4	3	

	Pectoral fin rays		
	17	18	19
A. hispidus			
Gilbert Is.	2	1	
A. immaculatus			
Gilbert Is.	1		
A. meleagris			
Gilbert Is.		1	2
Marshall Is.		1	6
A. nigropunctatus			
Gilbert Is.		1	2
Marshall Is.	1	4	1

Family ANTENNARIIDAE

Only two specimens of frog fishes were collected by the author at Onotoa. These and one specimen collected at Tarawa by Catala were turned over to Leonard P. Schultz of the United States National Museum, who is monographing the group. The identifications provided by Dr. Schultz are as follows: Antennarius nummifer (a 20 mm specimen collected from a tide pool on the outer reef flat at Onotoa), Antennarius coccineus (Onotoa specimen), and Antennarius altipinnis (Tarawa specimen).

Fowler (1928: 478-479) recorded Antennarius leprosus from Abaiang, Kingsmill Islands.

Gilbertese Names of Fishes at Onotoa

Abudefduf amabilis	Tereibu
Abudefduf lacrymatus	Tereibu
Abudefduf septemfasciatus	Tebukibuki
Abudefduf zonatus	Tereibu
Acanthocybium solandri	Tebara
64 Acanthurus achilles	Teribataukarawa
71 Acanthurus gahhm	Teribaroro
Acanthurus glaucopareius	Teribabui
7 Acanthurus guttatus	Tebaba
64 Acanthurus lineatus	Teribanti
Acanthurus nigroris	Tereiba
Acanthurus triostegus	Tekoinawa
Amanses sandwichiensis	Tebubuawai
Amphiprion sebae	Tenikatang
Anyperodon leucogrammicus	Tekuaurari
Aphareus furcatus	Teikakoa
Arothron hispidus	Tebuni
Arothron meleagris	Tebuni
Arothron nigropunctatus	Tebuni
Balistapus undulatus	Tebubutakataka
Bathygobius fuscus	Teuringabo
Belone platyura	Temake
Bothus mancus	Tebaibai
Bothus pantherinus	Tebaibai
Caesio xanthonotus	Tebukimaka
Canthigaster solandri	Tebatua
42 Caranx lugubris	Teaongo
38 Caranx melampygus	Tekuaua
350 Carcharhinus melanopterus	Tebakua
Cephalopholis argus	Tenimanang
Cephalopholis leopardus	Tenimako
Cephalopholis sonnerati	Tentabokai
Chaetodon auriga	Teibaba
Chaetodon bennetti	Teibaba
Chaetodon ephippium	Teibaba
Chaetodon falcula	Teibabataranga
Chaetodon lunula	Teibaba
Chaetodon ornatissimus	Teibaba
Chaetodon trifasciatus	Teibabataranga
Chaetodon vagabundus	Teibaba
168 Cheilinus trilobatus	Tetanai
Cheilinus undulatus	Tekaron
Chromis dimidiatus	Tereibu
Chromis lepidolepis	Tereibu
Chromis opercularis	Tereibu
Cirrhitus pinnulatus	Tereiati
Cirripectus spp.	Tentaremauri
Corythoichthys flavofasciatus	Tekoekoerikaki
Crenimugil crenilabis	Teaua
Ctenochaetus cyanoguttatus	Tekatawa

62	Ctenochaetus striatus	Teribaroro
328	Cypselurus spp.	Teonauti
	Dascyllus aruanus	Tenikatang
	Dascyllus trimaculatus	Tebukibuki
	Dinematichthys iluocoeteoides	Teuringabo
	Echidna zebra	Terabonotekabanga
55	Elagatis bipinnulatus	Tekama
	Epibulus insidiator	Teuianau
	Epinephelus flavocaeruleus	Tekuamamaninga
	Epinephelus fuscoguttatus	Temaneku
93	Epinephelus merra	Tekuau
325	Euthynnus yaito	Tetawatawa
[illegible]	Fistularia petimba	Tekoekoerikaki
	Gerres oblongus	Tenibongbong
349	Ginglymostoma ferrugineum	Tebakoa
[illegible]	Gnathodentex aureolineatus	Teneia
	Gomphosus tricolor	Tekimoa
	Gomphosus varius	Tenareau
	Gymnothorax bikiniensis	Tekaibiki
	Gymnothorax buroensis	Terabono
	Gymnothorax flavimarginata	Terabono
	Gymnothorax monostigma	Tebukimeri
	Gymnothorax petelli	Teimone
	Halichoeres centriquadrus	Tenewekabane
	Halichoeres marginatus	Tentabokai
	Halichoeres trimaculatus	Tearinai
	Hemigymnus fasciatus	Tenei
	Heniochus permutatus	Tereiati
	Holocentrus diadema	Tekubeibeti
	Holocentrus lacteoguttatus	Teku
	Holocentrus laevis	Teku
	Holocentrus microstomus	Tekubeibeti
	Holocentrus tiere	Tebureunawa
	Holocentrus violaceus	Teku
	Hyporhamphus dussumieri	Tekabubu
	Hyporhamphus laticeps	Tekabubu
	Istiblennius gibbifrons	Tentarema
	Istiblennius lineatus	Tentarema
	Istiblennius paulus	Tentarema
	Labroides dimidiatus	Teberu
	Lethrinus rhodopterus	Teokaoka
122	Lutjanus bohar	Tekananingo
	Lutjanus gibbus	Teikanibong
[illegible]	Lutjanus kasmira	Tetakabe
124	Lutjanus monostigmus	Tebabeina
[illegible]	Lutjanus vaigiensis	Tebukirabaraba or Tebawe
	Macropharyngodon meleagris	Tearinaimawa
131	Monotaxis grandoculis	Temoto
[illegible]	Mulloidichthys samoensis	Tebaweina
	Myripristis adustus	Tekungkung
	Myripristis murdjan	Temon
	Myripristis pralinius	Temon
	Neothunnus macropterus	Teingamea
	Ostracion meleagris	Tetoaua
	Oxymonacanthus longirostris	Tebubuawai

Paracirrhites arcatus	Tereiawawa
Parapercis cephalopunctatus	Teuringabo
Parupeneus barberinus	Temaebo
Parupeneus chryserydros	Tekaitewe
Parupeneus trifasciatus	Temawa
Pempheris oualensis	Tebarere
Plesiops nigricans	Tentabokai
Pomacentrus aureus	Tereibu
Pomacentrus coelestis	Tereibu
Pomacentrus jenkinsi	Tereibu
Pomacentrus nigricans	Tereibu
Pomacentrus vaiuli	Tenikatang
Pseudocheilinus hextaenia	Tenimawawa
Pseudochromis tapeinosoma	Tenikatang
Pseudogramma bilinearis	Tentarema
Priacanthus cruentatus	Teikauea
Pterocaesio tile	Tekawariki
Pterois radiata	Teikauea
Pypoplites diacanthus	Teikabingao
Rhinecanthus aculeatus	Tebubunabanaba
Rhinecanthus rectangulus	Tebubu
Samariscus sp.	Tebaibai
Saurida gracilis	Tenunua
Scarus brevifilis	Tewibubura
Scarus ghobban	Teouru
Scarus globiceps	Tenimawawa
149 Scarus harid	Teinai
161 Scarus niger	Teikabata
Scarus pectoralis	Teikamawa
Scarus sordidus (female)	Teikabata
Scarus sordidus (male)	Tenimaerere
Scorpaena albobrunnea	Tenouika
Scorpaenodes kelloggi	Tekuau
Scorpaenodes parvipinnis	Tenou
Scorpaenopsis gibbosus	Tenou
Sphyraena forsteri	Tenunua
Synodus variegatus	Teuringabo
108 Teuthis rostratus	Tenimunai
Thalassoma hardwicke	Tearinai
Thalassoma lunare	Tearinaimawa
Thalassoma melanochir	Tearinaimawa
Thalassoma quinquevittatum	Tearinaimawa
Thalassoma trilobata	Tenewekekabane
Uropterygius spp.	Terabono
Zanclus cornutus	Tentibetibei
Zebrasoma veliferum	Teibabataranga

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*No mention is made of fishes from the Gilbert Islands in this work. It is included here because it is cited in the text and because it was found to be the most useful work at the time of the expedition for the identification of fishes in Oceania.